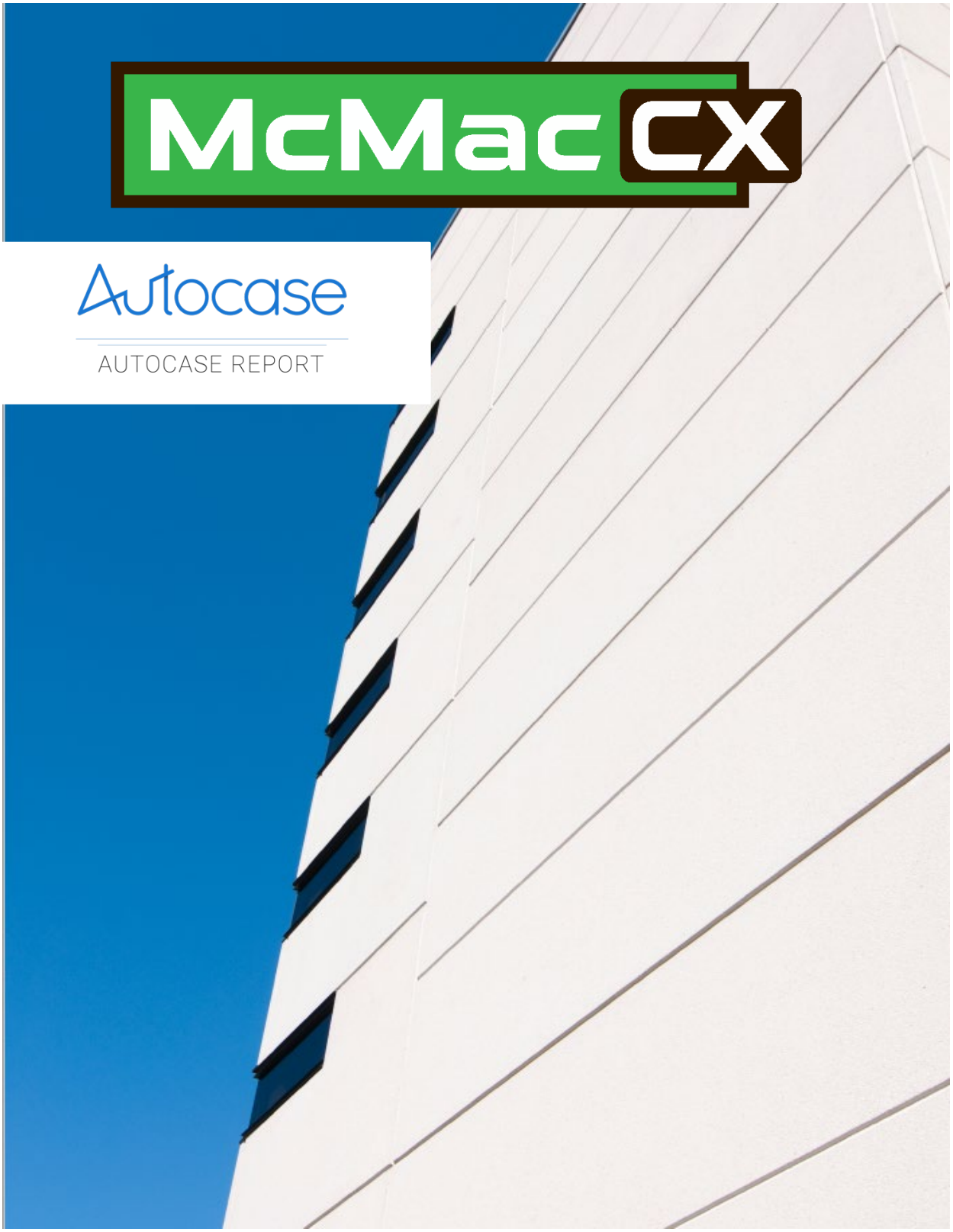

McMac CX

Autocase

Comparative Health & Prosperity Analysis (CHPA)

Example Report

Prepared by: David MacLean McMac CX

McMac CX

Autocase

Table of Contents

The layout of the report is as followed:

Preamble

The information provided in this report was prepared using the McMac CX / Autocase software application.

What is Included in this Report

This report is organized in the following way:

- How to Read This Report: This section will introduce the triple bottom line-cost benefit analysis “TBL-CBA” framework behind McMac CX / Autocase and describe how to interpret results.

- Useful Information & Resources: This section will provide further information about this analysis and where to download the methodologies and references.

- About the Project: This section contains information about the project characteristics, the design alternatives that have been analyzed, and the base case assumptions that lead to the results presented in this report.

- Results: The results section is divided in two parts. The first contains an executive summary to provide an overview of the results and the ranking of each design alternative. In the secondary part, results are provided for each design on a feature by feature basis, by stakeholder, and by impact (cost and benefit) category.

- Appendix A: A comparison of input values used in each design alternative and the base case scenario.

- Appendix B: Project specific inputs used in the analysis are summarized, including the advanced inputs and McMac CX / Autocase’s location specific data values.

Disclaimer

The information provided in this report was prepared using the McMac CX / Autocase software application - the information, statements, statistics, and commentary (together the ‘Information’) contained in this Report have been prepared by McMac CX / Autocase from publicly available material, discussions with industry experts and stakeholders, and from material provided by the client. McMac CX / Autocase has relied upon the accuracy, currency and completeness of the Information sourced in the public domain and that provided to it by the client and stakeholders and takes no responsibility for the

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How to Read this Report

This report is provided to aid in the decision making between various design alternatives that are being considered, as part of the project.

By assessing the triple bottom line – financial, social, and environmental – of your project, you now have the ability to steer your design in the way that will:

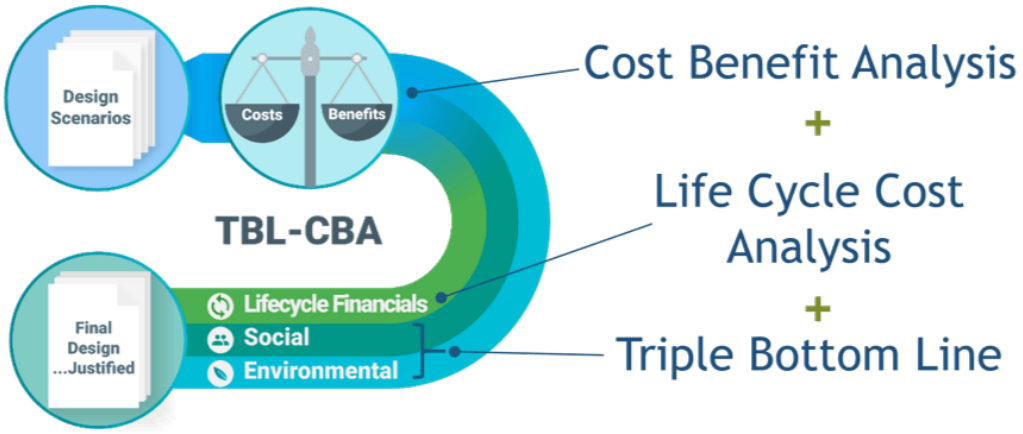
(1) Take into account the ongoing operations and maintenance costs, not just the initial capital costs;

(2) Consider all stakeholders in decision making and the impacts to each of them; namely, the owner, occupants and surrounding community;

(3) Provide the data and metrics to help make tough decisions about investment options in early stage planning, and continuously during the project completion.

The Framework: Triple Bottom Line Cost-Benefit Analysis

Triple bottom line-cost benefit analysis (TBL-CBA) is a framework for assessing the impacts of a design decision in dollar terms. It is an economic methodology used to aid in communication and decision making. The TBL-CBA economic business case framework uses best practice Life Cycle Cost Analysis (LCCA) and Cost Benefit Analysis (CBA) techniques to quantify and attribute dollar values to the financial, social and environmental impacts resulting from an investment.



- LCCA moves past simply assessing the upfront costs when making a decision, and instead evaluates alternatives to purchase, own, operate, maintain and replace an investment, when each is equally appropriate to be implemented on technical grounds.

- CBA is a formal way of organizing the evidence on the key positive and negative financial, social, and environmental impacts of projects. CBA is an industry standard decision-support tool used to inform and improve public policy projects and private projects. One of the strengths of CBA is that these effects are often hard to value and not priced in a market, and yet CBA puts them on a common dollar-based footing.

- Another advantage of CBA is that future and current costs and benefits are also adjusted so that they can be treated equally, to compare different alternatives of the same project that may have impacts occurring in different years. Future impacts are converted into a present-day dollar value using discounting. McMac CX / Autocase automatically factors in the time value of money through discounting and inflating, so the results you see are always in today's dollars. McMac CX / Autocase does this by using a 3% discount rate. The discount rate is a "real" discount rate, which means any inflation that is forecasted to occur in the future is taken into account (which means you do not have to worry about certain costs increasing in the future, as McMac CX / Autocase considers this).

- TBL-CBA evaluates the incremental triple bottom line impacts of various investments compared to a base case. When assessing the benefit of a decision, the alternative scenario - if a different decision is made, or no decision at all, has to be considered in order to understand the true costs and benefits.

The objective may be to decide whether to proceed with the project, to see if the benefits justify the costs, to place a value on the project, or to decide which of various possible alternatives would be the most cost-effective. TBL-CBA not only includes full LCCA for financial considerations, but also aids in the decision-making process of CBA, by including the costs and benefits to the surrounding community and environment. Altogether, TBL-CBA is a comprehensive decision-making tool, that not only accounts for the tangible benefits, such as the financial costs over time, but also the intangible benefits, such as improved air quality or occupant health.

The Net Present Value (NPV) is the metric used to compare and rank designs. NPV is the present value of benefits net of present value of costs over the project's entire life – it is the projected future cash flows over 20 years which are discounted to current

dollars at a 3% discount rate, showing the full value of the project over 20 years in today's dollars. NPV is the principal measure of a capital investment's economic worth:

TBL-NPV > 0: benefits are larger than costs.

TBL-NPV < 0: costs are larger than benefits.

Base Case and Design Alternatives

The Base Case is the scenario against which each Design Alternative is being compared against. Every result illustrated in this report represents the incremental difference compared to the Base Case. In general, the Base Case represents the "business as usual" or "do nothing" scenario.

McMac CX / Autocase provides location and project specific default values for the Base Case, such as average energy usage by location and building type. McMac CX / Autocase recommends that the base case is minimum building code requirements for new constructions or current day operations for renovations in order to show the value provided by incremental improvements in the Design Alternatives.

Resources & Methodologies

Methodologies

All the methodologies used by McMac CX / Autocase to generate results are downloadable in a PDF format through the McMac CX / Autocase software application. The methodologies are described and accompanied by graphical descriptions called structure and logic diagrams.

The methodologies are divided by the following design components:

McMac CX / Autocase Design Components

Clean Energy

Lighting

Mechanical

Water

Envelope

Interior

Structure

Site

References

McMac CX / Autocase is transparent about providing sources of its pre-populated default values (if relied upon by the project), advanced inputs (the overridable location-specific input values), and the methodologies. All references can be found in the methodologies, downloadable in a PDF format through the McMac CX / Autocase software application.

About the Project

Project Description & Goals of this Analysis

CHPA Sample Output is located in Houston, TX, US. This project compared 2 design alternatives using McMac CX / Autocase. The goals of the project were to consider options related to Mechanical, Electrical, Interiors, Life Cycle Cost Analysis Module, Energy Module, Water Analysis, Water Analysis, Water Analysis, Water Analysis, Other Costs and Benefits, Site, Other, Materials Module, and Ground Cover. This project factored in location specific analyses and evaluated the impacts (cost and benefits) of Social Value of Water, Carbon Sequestration, Productivity, Health - Heat Island, Rent, Financial Savings from Water, Community Recreation, Health, Carbon Emissions, Financial Savings from Electricity, Social Value Air Pollution, Occupant Recreation, and Absenteeism. This project looked at those impacts for each stakeholder individually, including the owner, occupant and community.

This project is assumed to begin construction on December 08, 2021 and continue for 0.1 years. This project has been evaluated over 20 years. In order to account for the difference between a dollar today and a dollar tomorrow, McMac CX / Autocase displays project results in terms of net present value (NPV), using a discount rate of 3%. For further details on the assumptions and data used for this report, please see Appendix B for a complete list of project-wide data used in this analysis.

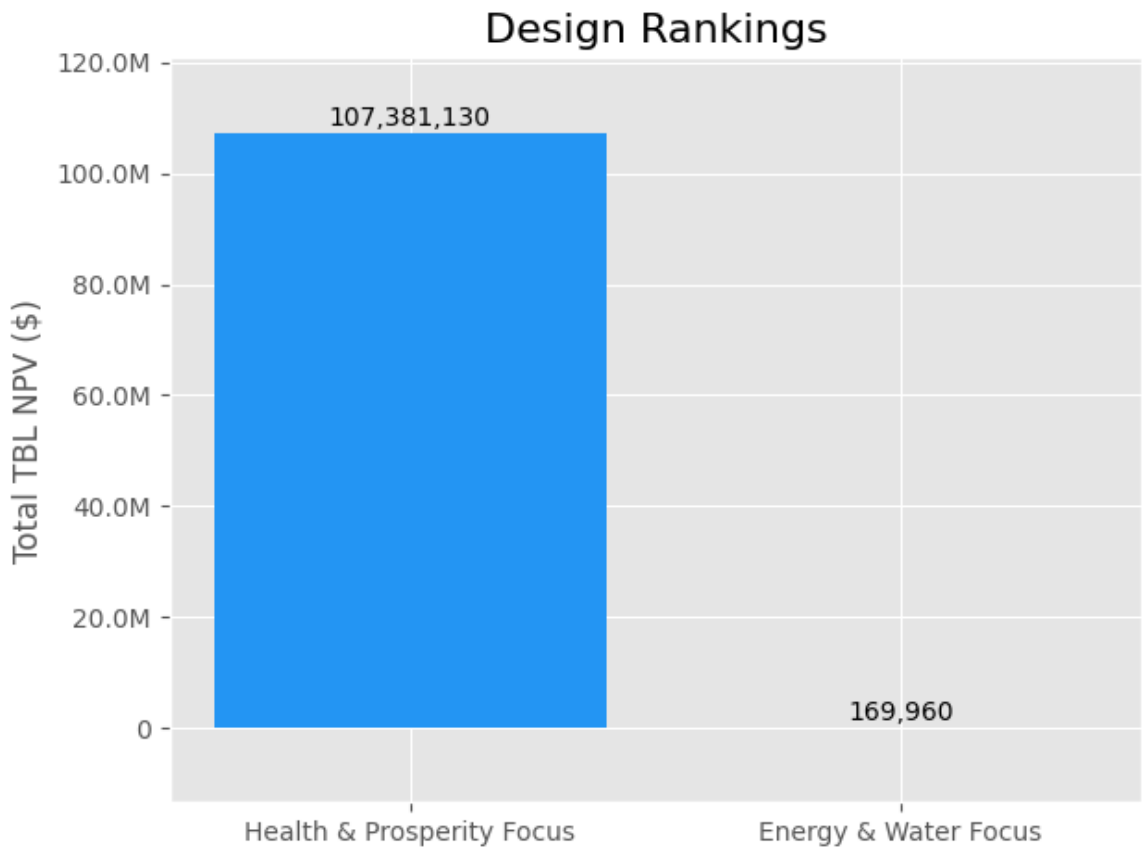
This project factored in location specific inputs and evaluated the impacts (cost and benefits) of:

- Absenteeism
- Carbon Emissions
- Carbon Sequestration
- Carbon User Costs
- Community Recreation
- Financial Carbon Costs
- Financial Savings from Electricity
- Financial Savings from Natural Gas
- Financial Savings from Water
- Government Spend
- Health
- Health - Heat Island
- Incentives
- Occupant Recreation
- Operations and Maintenance Costs
- Productivity
- Renewable Energy Revenue
- Replacement Costs
- Residual Value of Assets
- Salvage Value
- Social Value Air Pollution
- Social Value of Water
- Student Productivity
- Tax Credits
- Upfront Capital Costs

Results

Executive Summary

The following graph represents the total Net Present Value (NPV) of each design alternative analyzed for this project compared to the Base Case.



NPV is the preferred metric to compare design alternatives, as it is reliable regardless of the timing of individual cashflows, the discount rate chosen, and the allocation of which cash flows are considered benefits or costs. Other metrics are also calculated for each design and can be compared in the table below.

- The Financial Return on Investment (ROI): indicates whether financial gains outweigh the upfront financial investment. A high ROI means the investment's gains were significantly higher than its costs. An ROI is often compared to an internal hurdle rate of return, based on the cost of capital to the investor, to determine whether the project should proceed.

- The Financial Discounted Payback Period (DPP): determines the time it takes to pay back the initial upfront investment. In McMac CX / Autocase, only the financial impacts are included in this calculation, not the social or environmental. The lower the DPP number, the quicker the payback.

- The Benefit Cost Ratio (BCR): is benefits divided by costs (discounted in present value terms). The BCR is an efficiency indicator that explains how many benefits the project creates for every dollar of cost spent on the project. If the budget is constrained, a higher benefit cost ratio is preferred due to every dollar of investment cost being worth more in benefit. A BCR greater than 1 means that more than $1 of benefit is generated for every $1 in cost, thus representing good value for money. A BCR less than one means that the costs associated with that design are higher than the benefits.

Table of Results Metrics

Design	Metric	Result
Health & Prosperity Focus	Net Present Value	$107,381,130
	Return on Investment	-55%
	Financial Discounted Payback Period	Never
	Benefit Cost Ratio	144.2
Energy & Water Focus	Net Present Value	$169,960
	Return on Investment	-13%
	Financial Discounted Payback Period	Never
	Benefit Cost Ratio	1.2

Results for Each Design Alternative

This section contains results and information for each design alternative. The results are organized in the following way:

- Financial, Social and Environmental Impacts
- Breakdown by Feature Investment
- Stakeholders Impacts - Owners, Occupants, Community
- Carbon Footprint

Health & Prosperity Focus

Health & Prosperity Focus has a NPV of $107,381,130 and the following other resulting metrics.

Table of Financial Ratio Results

Net Present Value	$107,381,130
Return on Investment	-55%
Financial Discounted Payback Period	Never
Benefit Cost Ratio	144.2

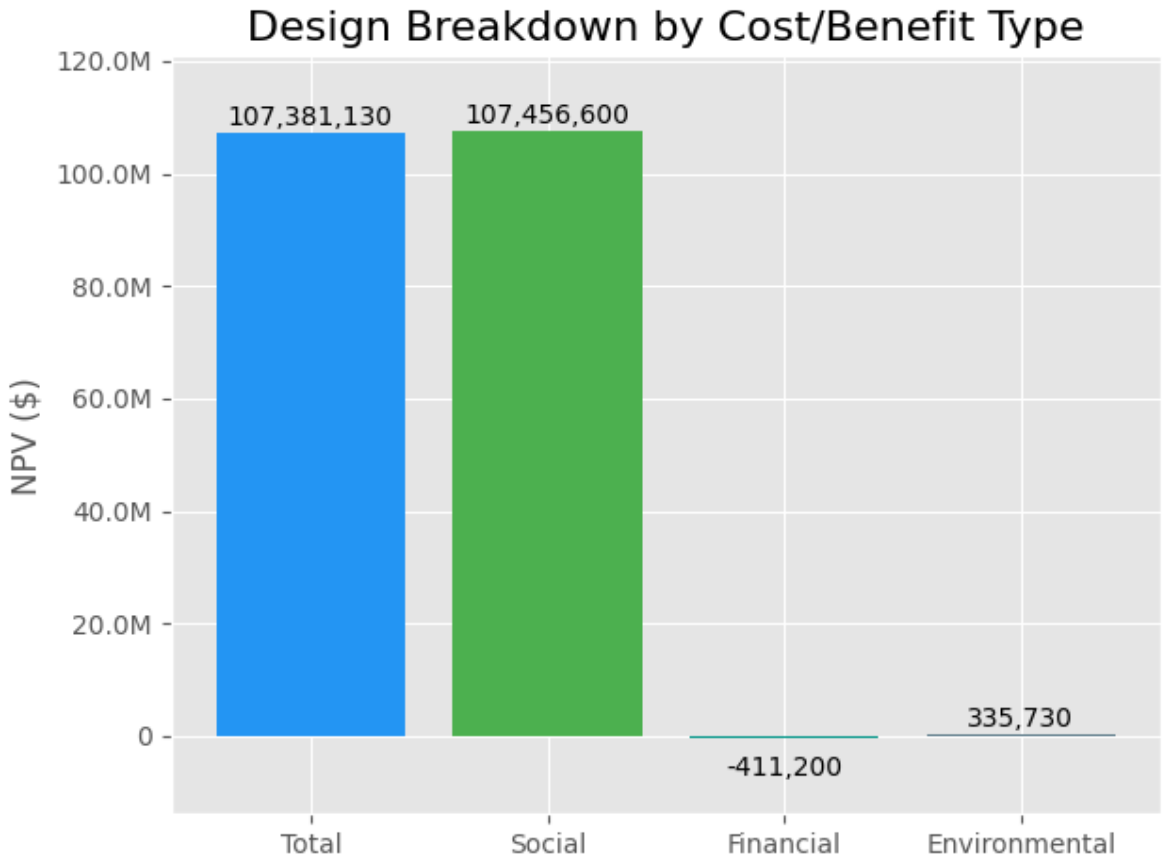
The individual cash flows that are added together to get the full NPV result can be broken out by cost/benefit category. These categories are also assigned a stakeholder who realizes the impact, in addition to a cost/benefit category, breaking them out into financial, social and environmental impacts. Social impacts affect individuals while environmental impacts affect communities more broadly.

Table of Impact Category Results

Cost Benefit Category	Stakeholder	Benefit/Cost Type	Lifetime NPV
Upfront Capital Costs	Owner	Financial	$0
Replacement Costs	Owner	Financial	$0
Salvage Value	Owner	Financial	$0
Residual Value of Assets	Owner	Financial	$0
Operations and Maintenance Costs	Owner	Financial	$0
Social Value Air Pollution	Community	Environmental	$55,530
Carbon Emissions	Community	Environmental	$82,390
Financial Savings from Electricity	Occupant	Financial	$271,300
Financial Savings from Natural Gas	Occupant	Financial	$0
Financial Savings from Water	Occupant	Financial	$67,500
Social Value of Water	Community	Environmental	$410
Rent	Occupant	Financial	-$750,000
Occupant Recreation	Occupant	Social	$283,800
Community Recreation	Community	Social	$283,800
Carbon Sequestration	Community	Environmental	$197,400
Health - Heat Island	Community	Social	$94,500
Productivity	Occupant	Social	$95,450,000
Absenteeism	Occupant	Social	$4,649,500
Health	Occupant	Social	$6,695,000

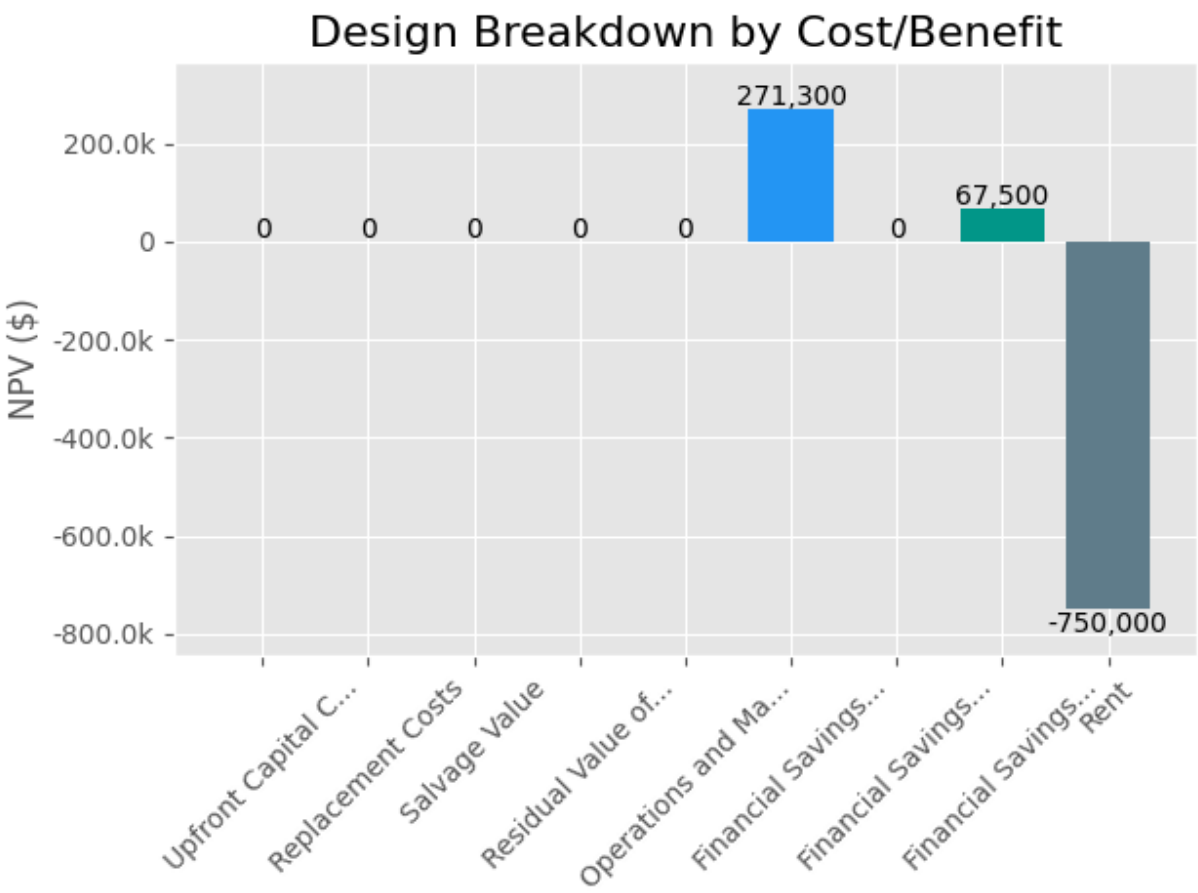
Financial, Social and Environmental Impacts

The breakdown of the total impacts of Health & Prosperity Focus, is showcased in three buckets: financial, social and environmental. Financial impacts pertain to the hard cash values, such as capital costs, operational and maintenance costs, replacement costs, utilities incentives, and tax credits. Social impacts include impacts to the surrounding community outside of the building or those tenants in the building. Social impacts include productivity, reduced absenteeism, improved health benefits, and the social value of water. Environmental impacts are those that have an impact on the surrounding environment to the building in the broader community, such as carbon emissions or air pollution.



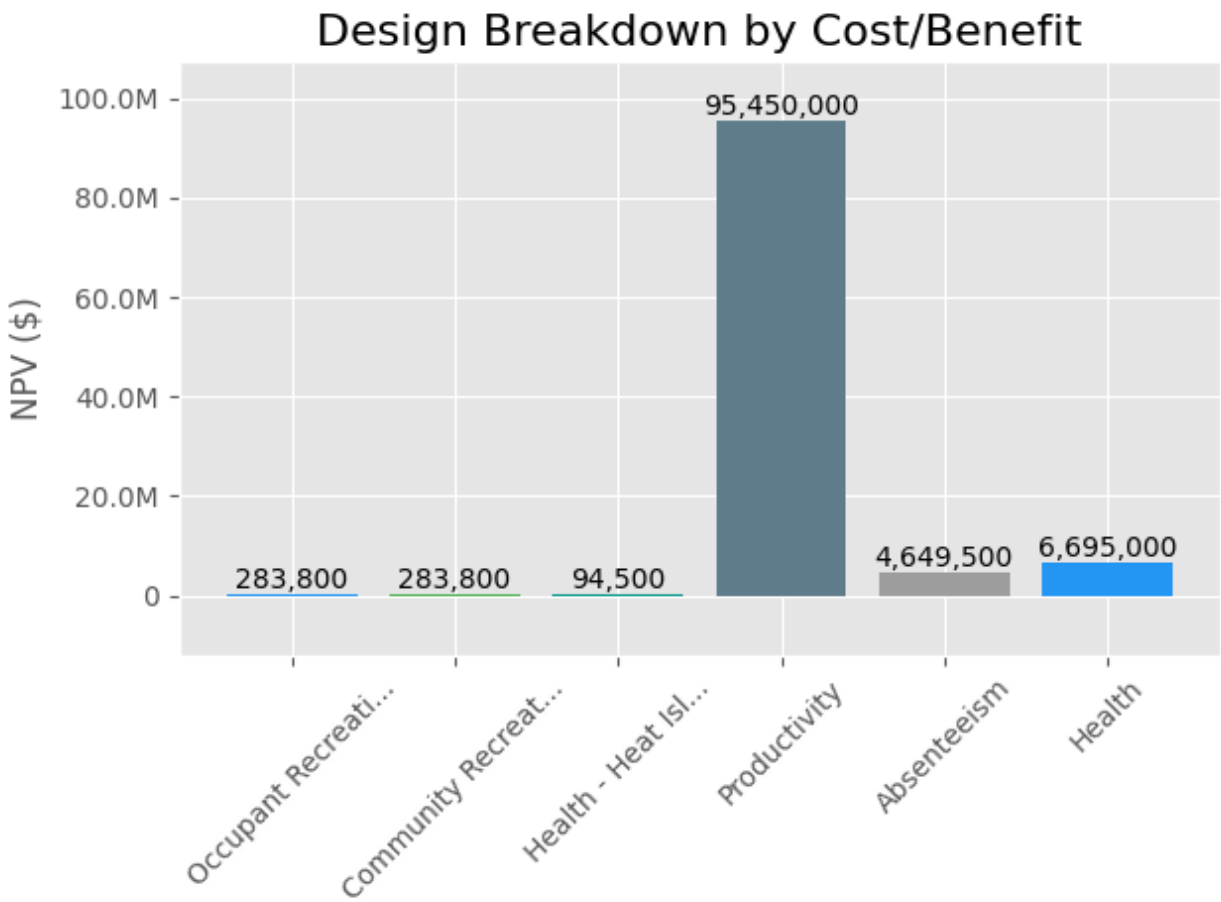
The financial impacts of this design include:

- Upfront Capital Costs ($0)
- Replacement Costs ($0)
- Salvage Value ($0)
- Residual Value of Assets ($0)
- Operations and Maintenance Costs ($0)
- Financial Savings from Electricity ($271,300)
- Financial Savings from Natural Gas ($0)
- Financial Savings from Water ($67,500)
- Rent (-$750,000)



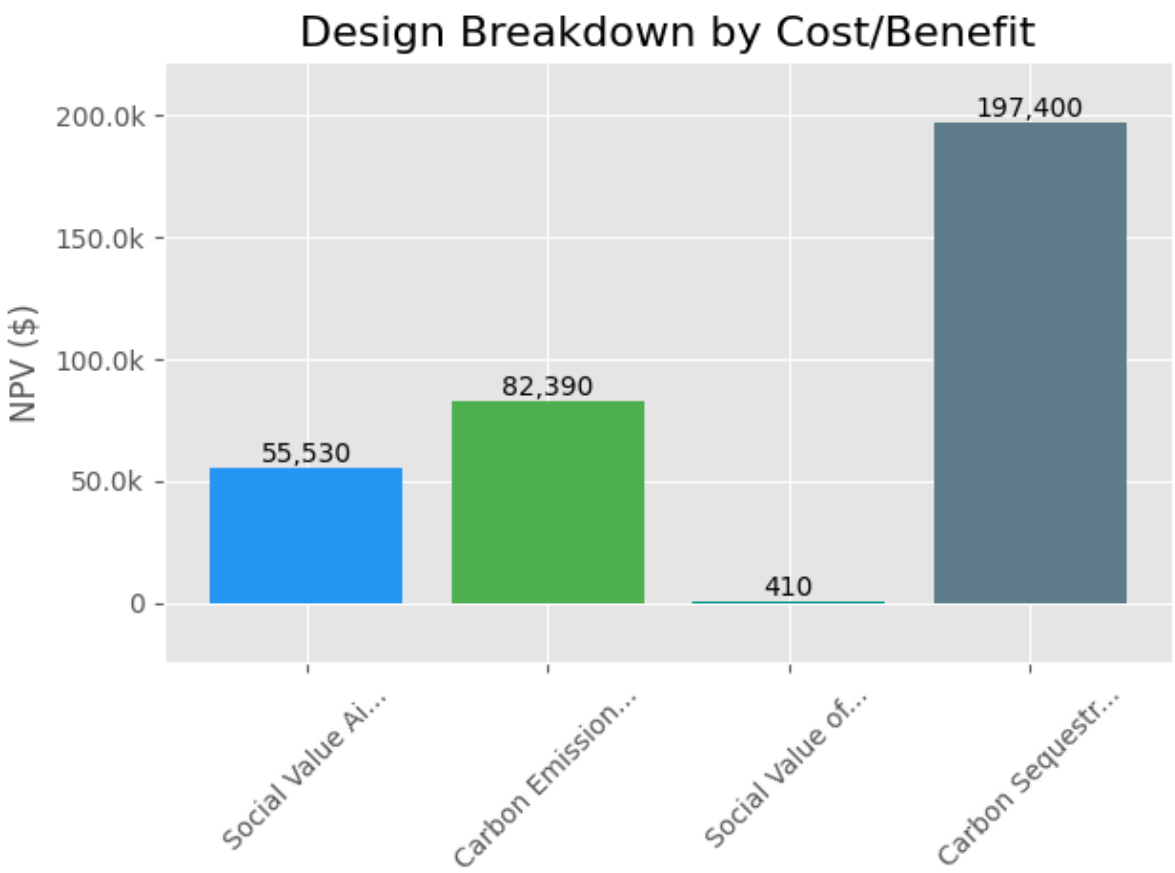
The social impacts of this design include:

- Occupant Recreation ($283,800)
- Community Recreation ($283,800)
- Health - Heat Island ($94,500)
- Productivity ($95,450,000)
- Absenteeism ($4,649,500)
- Health ($6,695,000)



The environmental impacts of this design include:

- Social Value Air Pollution ($55,530)
- Carbon Emissions ($82,390)
- Social Value of Water ($410)
- Carbon Sequestration ($197,400)



Environmental related impacts are put into dollar terms by applying social cost factors. Such factors represent the social costs imposed on community stakeholders and the environment from the degradation of ecosystem services and regional air quality. More details on the applicability and nuances of social costs can be found in the Methodologies report download in McMac CX / Autocase. McMac CX / Autocase first calculates the quantities of pollutant changes resulting from efficiency investments in the design case compared to the base case, and then monetizes these emission changes by applying the social cost of each respective air pollutant.

Table of Pollutant Quantity Changes

Pollutant Quantity Changes	Value
Nitrogen Oxide (pounds)	-2,390
Sulfur Dioxide (pounds)	-3,271
Volatile Organic Compounds (pounds)	-39
Particulate Matter 2.5 (pounds)	-180
Carbon Dioxide (tonnes)	-7,849

Carbon Dioxide by Investment	Value (tonnes)
Graywater Reuse	0
Rainwater Harvesting	0
On-site Water Usage	0
Water From Utilities	-20
Mechanical	-583
Water Analysis	-164
Electrical	-956
Materials Module	0
Site	-6,126

Features Breakdown

The components that were included in Health & Prosperity Focus include Mechanical, Other, Water Analysis, Electrical, Site, Interiors, and Ground Cover. The Productivity feature returned the highest NPV result, while the Rent returned the lowest NPV result.

Table of Feature by Feature Results

Cost Benefit Category	Cost Benefit Category	Lifetime NPV
Mechanical	Social Value Air Pollution	$17,700
	Carbon Emissions	$27,900
	Financial Savings from Electricity	$92,900
	Productivity	$3,882,000
	Absenteeism	$458,500
	Health	$2,723,000
Other	Rent	-$750,000
Water Analysis	Social Value Air Pollution	$5,580
	Carbon Emissions	$8,790
	Financial Savings from Electricity	$26,200
	Financial Savings from Water	$67,500
	Social Value of Water	$410
Electrical	Social Value Air Pollution	$29,000
	Carbon Emissions	$45,700
	Financial Savings from Electricity	$152,200
	Productivity	$15,818,000
	Health	$3,972,000
Site	Occupant Recreation	$283,800
	Community Recreation	$283,800

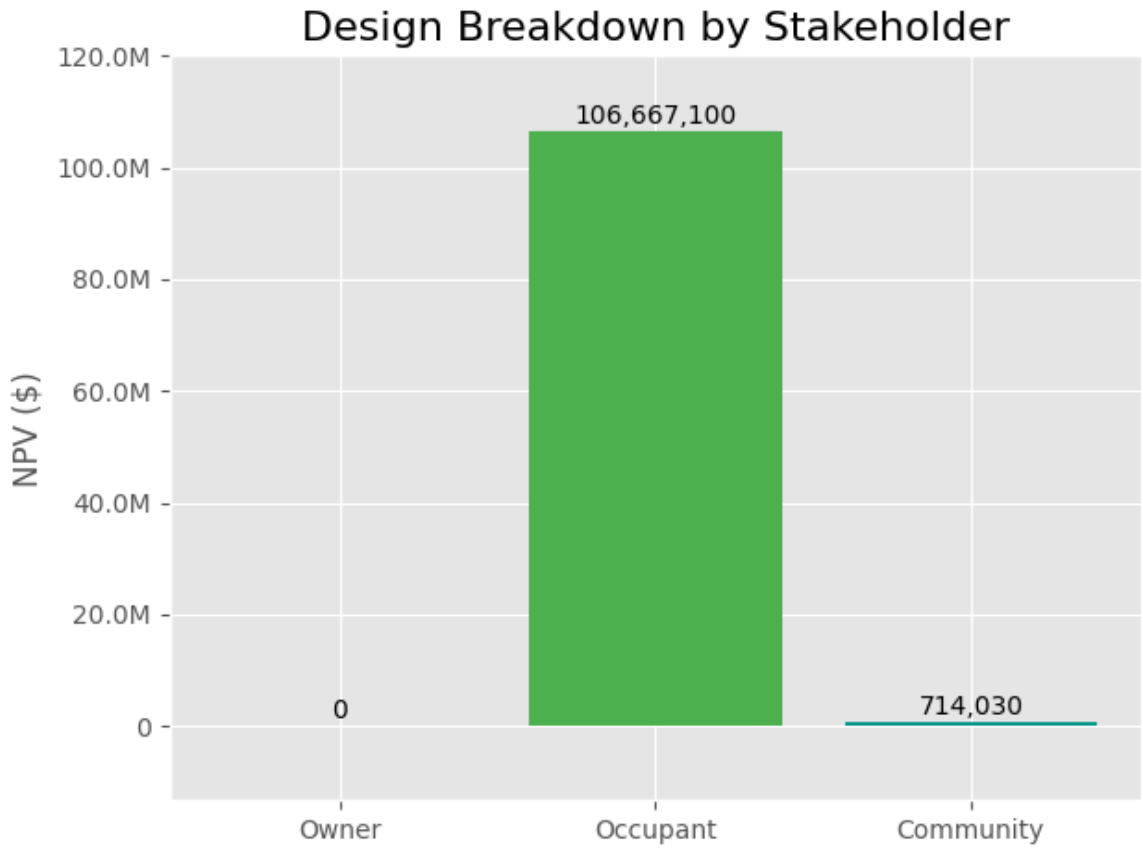
Interiors	Productivity	$75,750,000
	Absenteeism	$4,191,000
Ground Cover	Carbon Sequestration	$197,400
	Social Value Air Pollution	$3,250
	Health - Heat Island	$94,500

Stakeholders Impacts - Owners, Occupants, Community

Each design has an impact on various stakeholders of that design. These stakeholders include the owners of the building, the occupants of the building, and the community surrounding that building.

McMac CX / Autocase provides the flexibility to attribute different cash flows to different stakeholders. For example, if an owner is also a tenant, they will be attributed both the cost of the investments and the occupant benefits. Or, if an owner is leasing a building, the rental agreement may or may not include energy utility costs, which can be changed.

These graphs show visually who benefits the most from the project design.



Carbon Footprint

Carbon Emissions Reductions by Feature

The following table shows the total tonnes of carbon equivalent reduced by the design for each feature, compared to the Base Case.

Feature	Tonnes of CO_2 Equivalents
Graywater Reuse	0
Rainwater Harvesting	0
On-site Water Usage	0
Water From Utilities	-20
Mechanical	-583
Water Analysis	-164
Electrical	-956
Materials Module	0
Site	-6,126

Carbon Story

The following table contains the total tonnes of carbon equivalent generated, avoided, captured by vegetation, and offset by the design across the entire study period. The carbon quantities shown in the table are absolute values (they are not relative to the base case).

The embodied carbon refers to the equivalent carbon embodied in the building materials, that goes from the energy spent on the extraction of the raw materials to shipping and installation. The operational carbon is divided between the carbon generated due to energy consumption and water usage.

Feature	Tonnes of CO_2 Equivalents
Carbon Emitted During Operations (Water Consumptions)	59
Carbon Emitted During Operations (Energy Consumptions)	9,651
Embodied Carbon (Building Materials)	0
Carbon Sequestered by On-Site Vegetation	6,158

2030 Challenge by Architecture 2030

To learn more about the 2030 Challenge, visit https://architecture2030.org/2030_challenges/2030-challenge/

Energy & Water Focus

Energy & Water Focus has a NPV of $169,960 and the following other resulting metrics.

Table of Financial Ratio Results

Net Present Value	$169,960
Return on Investment	-13%
Financial Discounted Payback Period	Never
Benefit Cost Ratio	1.2

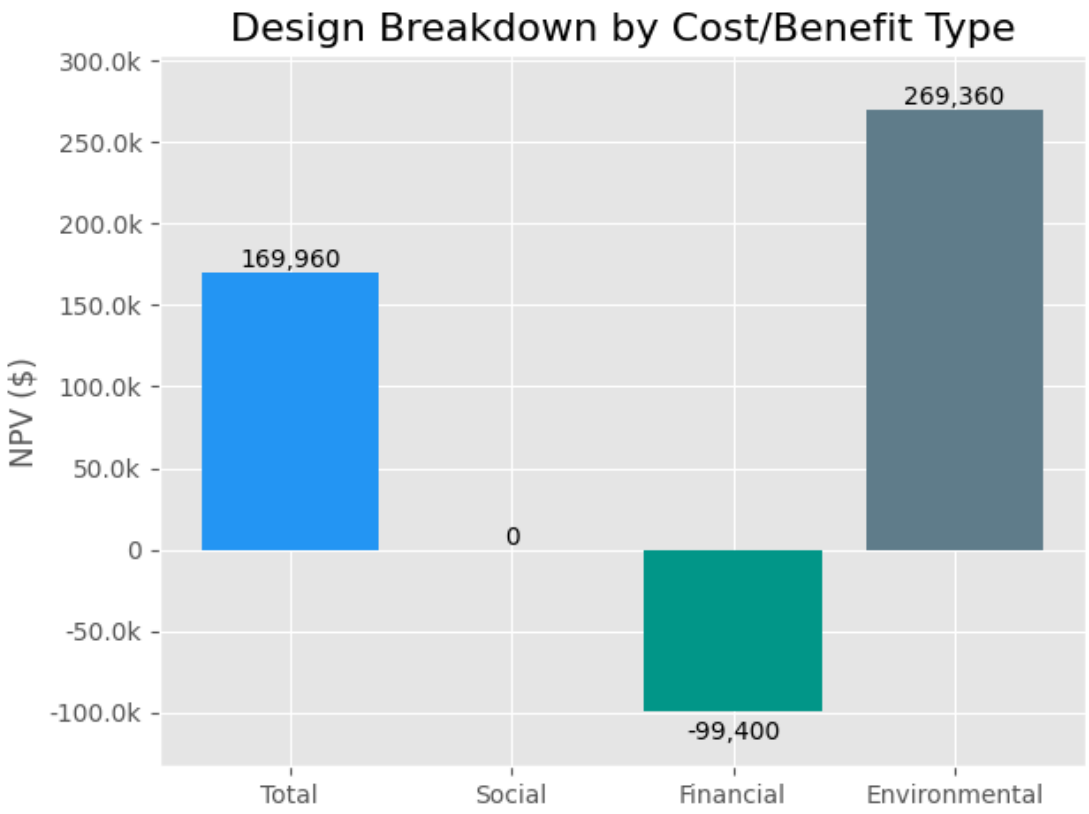
The individual cash flows that are added together to get the full NPV result can be broken out by cost/benefit category. These categories are also assigned a stakeholder who realizes the impact, in addition to a cost/benefit category, breaking them out into financial, social and environmental impacts. Social impacts affect individuals while environmental impacts affect communities more broadly.

Table of Impact Category Results

Cost Benefit Category	Stakeholder	Benefit/Cost Type	Lifetime NPV
Upfront Capital Costs	Owner	Financial	$0
Replacement Costs	Owner	Financial	$0
Salvage Value	Owner	Financial	$0
Residual Value of Assets	Owner	Financial	$0
Operations and Maintenance Costs	Owner	Financial	$0
Social Value Air Pollution	Community	Environmental	$104,320
Carbon Emissions	Community	Environmental	$164,390
Financial Savings from Electricity	Occupant	Financial	$542,600
Financial Savings from Natural Gas	Occupant	Financial	$0
Financial Savings from Water	Occupant	Financial	$108,000
Social Value of Water	Community	Environmental	$650
Rent	Occupant	Financial	-$750,000
Occupant Recreation	Occupant	Social	$0
Community Recreation	Community	Social	$0
Carbon Sequestration	Community	Environmental	$0
Health - Heat Island	Community	Social	$0
Productivity	Occupant	Social	$0
Absenteeism	Occupant	Social	$0
Health	Occupant	Social	$0

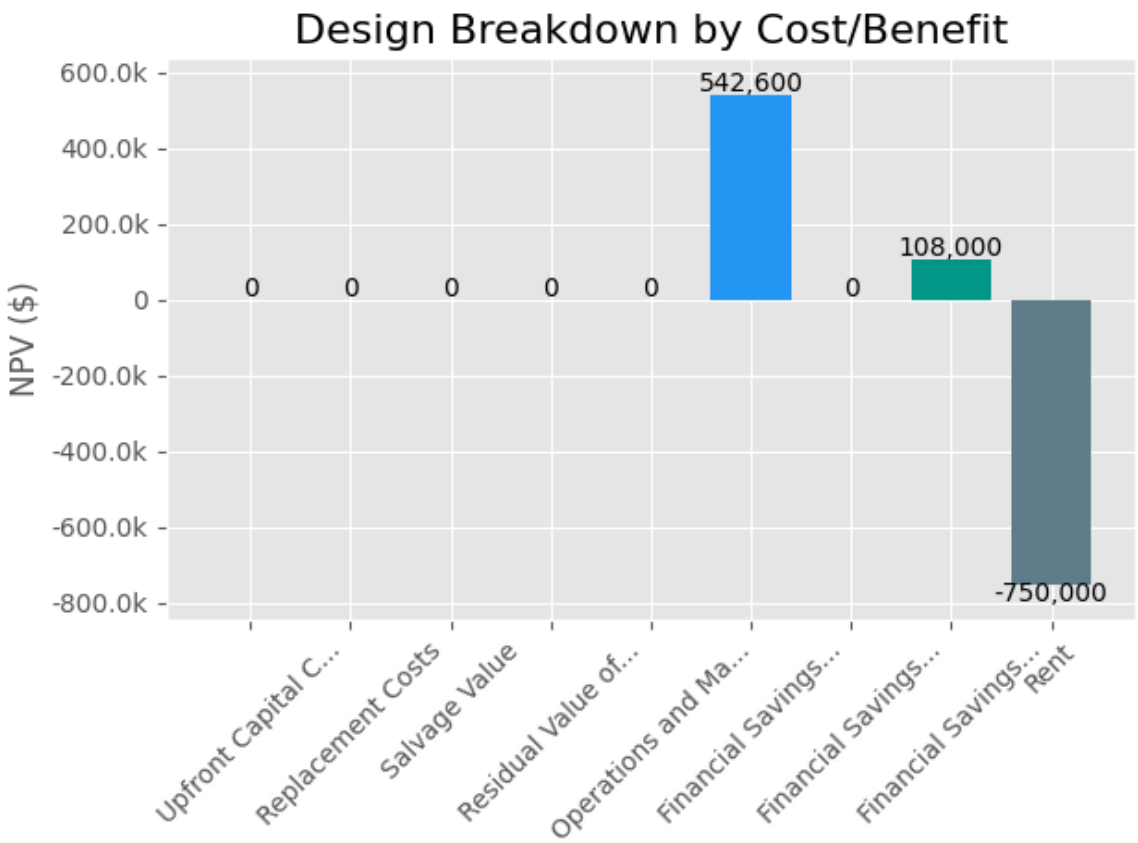
Financial, Social and Environmental Impacts

The breakdown of the total impacts of Energy & Water Focus, is showcased in three buckets: financial, social and environmental. Financial impacts pertain to the hard cash values, such as capital costs, operational and maintenance costs, replacement costs, utilities incentives, and tax credits. Social impacts include impacts to the surrounding community outside of the building or those tenants in the building. Social impacts include productivity, reduced absenteeism, improved health benefits, and the social value of water. Environmental impacts are those that have an impact on the surrounding environment to the building in the broader community, such as carbon emissions or air pollution.



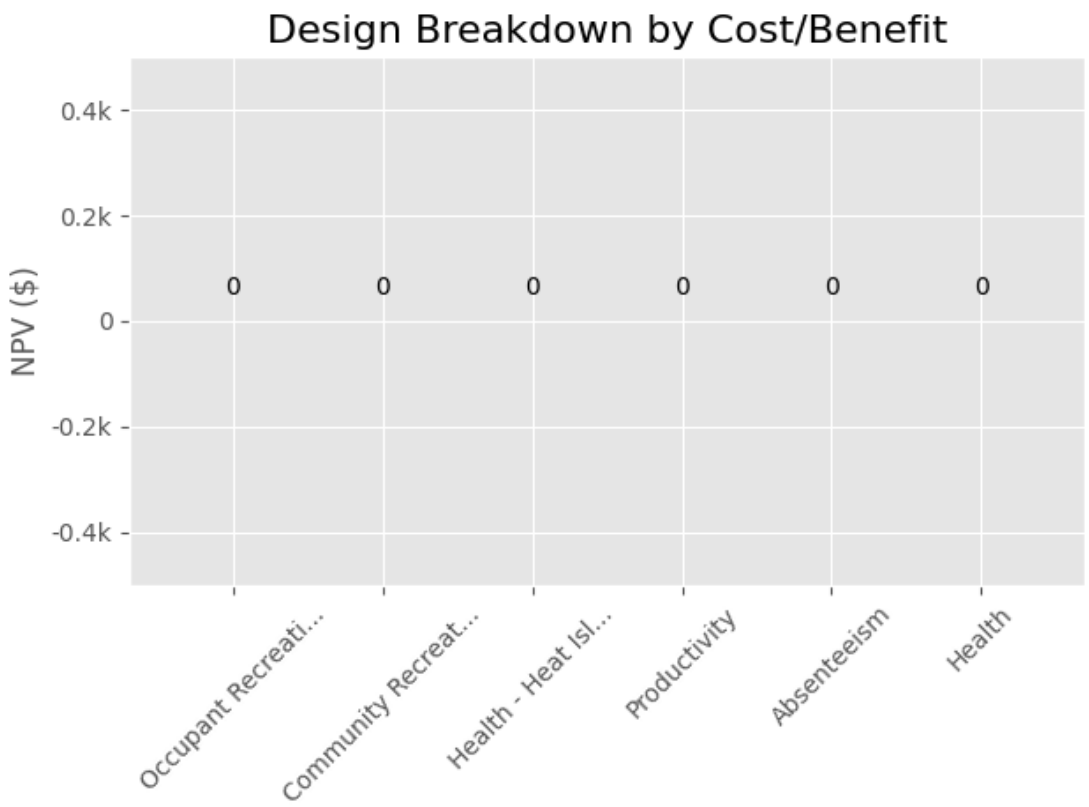
The financial impacts of this design include:

- Upfront Capital Costs ($0)
- Replacement Costs ($0)
- Salvage Value ($0)
- Residual Value of Assets ($0)
- Operations and Maintenance Costs ($0)
- Financial Savings from Electricity ($542,600)
- Financial Savings from Natural Gas ($0)
- Financial Savings from Water ($108,000)
- Rent (-$750,000)



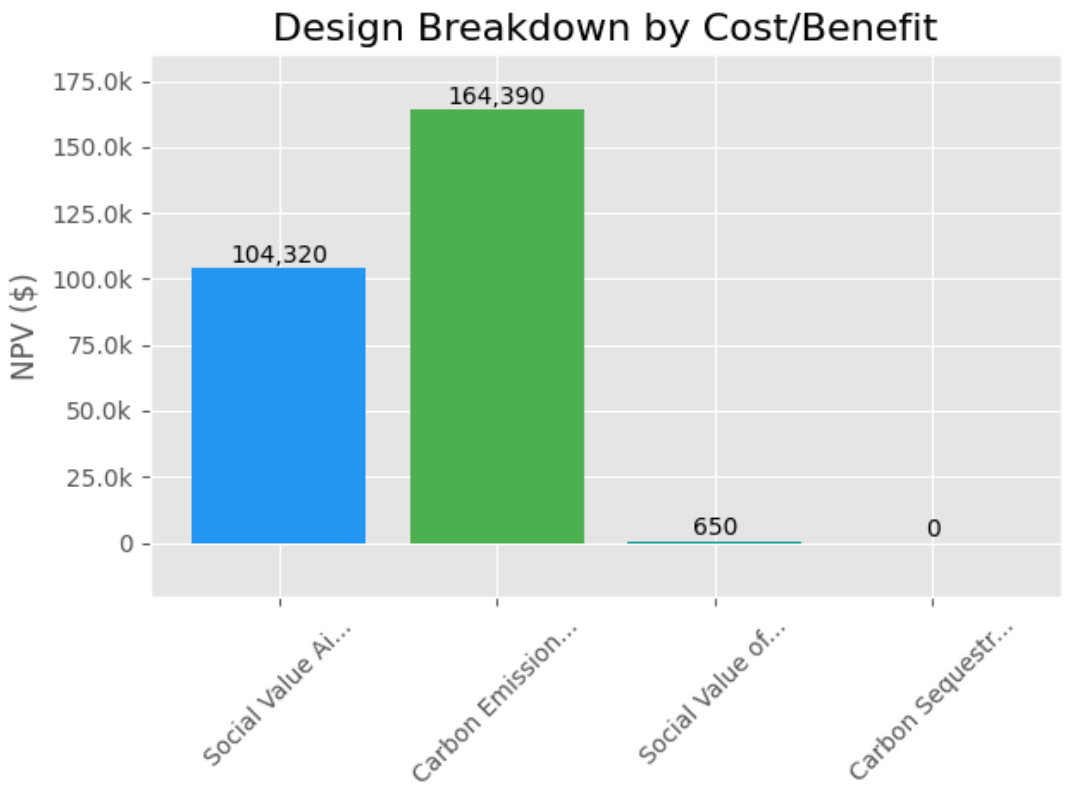
The social impacts of this design include:

- Occupant Recreation ($0)
- Community Recreation ($0)
- Health - Heat Island ($0)
- Productivity ($0)
- Absenteeism ($0)
- Health ($0)



The environmental impacts of this design include:

- Social Value Air Pollution ($104,320)
- Carbon Emissions ($164,390)
- Social Value of Water ($650)
- Carbon Sequestration ($0)



Environmental related impacts are put into dollar terms by applying social cost factors. Such factors represent the social costs imposed on community stakeholders and the environment from the degradation of ecosystem services and regional air quality. More details on the applicability and nuances of social costs can be found in the Methodologies report download in McMac CX / Autocase. McMac CX / Autocase first calculates the quantities of pollutant changes resulting from efficiency investments in the design case compared to the base case, and then monetizes these emission changes by applying the social cost of each respective air pollutant.

Table of Pollutant Quantity Changes

Pollutant Quantity Changes	Value
Nitrogen Oxide (pounds)	-4,769
Sulfur Dioxide (pounds)	-6,528
Volatile Organic Compounds (pounds)	-78
Particulate Matter 2.5 (pounds)	-361
Carbon Dioxide (tonnes)	-3,437

Carbon Dioxide by Investment	Value (tonnes)
Graywater Reuse	0
Rainwater Harvesting	0
On-site Water Usage	0
Water From Utilities	-31
Mechanical	-1,166
Water Analysis	-329
Electrical	-1,911
Materials Module	0
Site	0

Features Breakdown

The components that were included in Energy & Water Focus include Mechanical, Other, Water Analysis, and Electrical. The Financial Savings from Electricity feature returned the highest NPV result, while the Rent returned the lowest NPV result.

Table of Feature by Feature Results

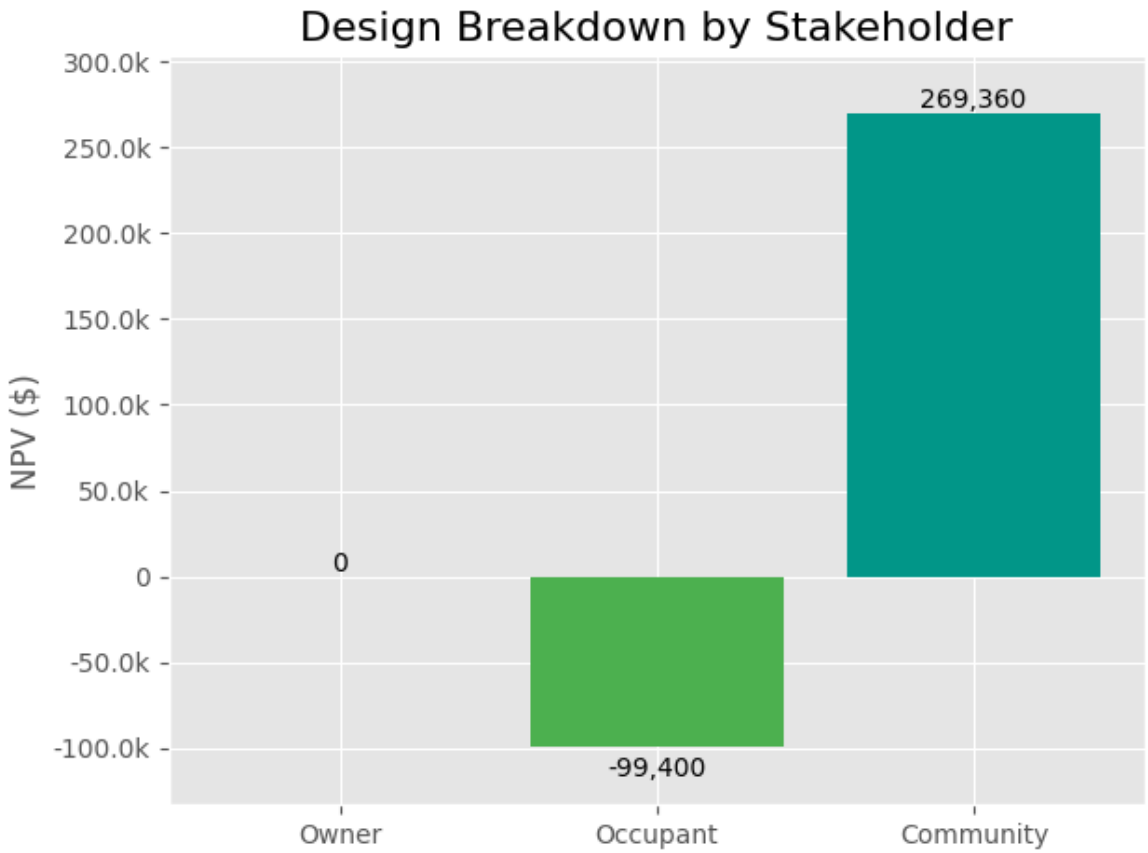
Cost Benefit Category	Cost Benefit Category	Lifetime NPV
Mechanical	Social Value Air Pollution	$35,400
	Carbon Emissions	$55,800
	Financial Savings from Electricity	$185,800
Other	Rent	-$750,000
Water Analysis	Social Value Air Pollution	$10,920
	Carbon Emissions	$17,190
	Financial Savings from Electricity	$52,400
	Financial Savings from Water	$108,000
	Social Value of Water	$650
Electrical	Social Value Air Pollution	$58,000
	Carbon Emissions	$91,400
	Financial Savings from Electricity	$304,400

Stakeholders Impacts - Owners, Occupants, Community

Each design has an impact on various stakeholders of that design. These stakeholders include the owners of the building, the occupants of the building, and the community surrounding that building.

McMac CX / Autocase provides the flexibility to attribute different cash flows to different stakeholders. For example, if an owner is also a tenant, they will be attributed both the cost of the investments and the occupant benefits. Or, if an owner is leasing a building, the rental agreement may or may not include energy utility costs, which can be changed.

These graphs show visually who benefits the most from the project design.



Carbon Footprint

Carbon Emissions Reductions by Feature

The following table shows the total tonnes of carbon equivalent reduced by the design for each feature, compared to the Base Case.

Feature	Tonnes of CO_2 Equivalents
Graywater Reuse	0
Rainwater Harvesting	0
On-site Water Usage	0
Water From Utilities	-31
Mechanical	-1,166
Water Analysis	-329
Electrical	-1,911
Materials Module	0
Site	0

Carbon Story

The following table contains the total tonnes of carbon equivalent generated, avoided, captured by vegetation, and offset by the design across the entire study period. The carbon quantities shown in the table are absolute values (they are not relative to the base case).

The embodied carbon refers to the equivalent carbon embodied in the building materials, that goes from the energy spent on the extraction of the raw materials to shipping and installation. The operational carbon is divided between the carbon generated due to energy consumption and water usage.

Feature	Tonnes of CO_2 Equivalents
Carbon Emitted During Operations (Water Consumptions)	47
Carbon Emitted During Operations (Energy Consumptions)	7,948
Embodied Carbon (Building Materials)	0
Carbon Sequestered by On-Site Vegetation	31

2030 Challenge by Architecture 2030

To learn more about the 2030 Challenge, visit https://architecture2030.org/2030_challenges/2030-challenge/

Appendix A

The following tables show each design alternative along with the base case inputs for comparison.

Health & Prosperity Focus

Energy Module	Base Case	Design Case
Energy Efficiency	Base	15%

Mechanical	Base Case	Design Case
Ventilation		
What is the building ventilation rate?	17 cfm/person	20 cfm/person
Thermal Comfort		
Percent of employees who have access to thermal comfort controls	25 Percent	60 Percent
What is the setpoint temperature inside the building in the winter?	70 Degrees (Fahrenheit)	71 Degrees (Fahrenheit)
What is the setpoint temperature inside the building in the summer?	75 Degrees (Fahrenheit)	73 Degrees (Fahrenheit)
Filtration		
What is the MERV efficiency rating of your filters?	MERV rating: 6 Occupant Percent: 100%	MERV rating: 13 Occupant Percent: 100%

Life Cycle Cost Analysis Module	Base Case	Design Case

Electrical	Base Case	Design Case
Interior Lighting		
What percentage of employees have access to lighting controls?	25 Percent	60 Percent
Daylighting		
Indicate the proportion of employees (percent) that have access to daylighting during the day, or the spatial daylighting autonomy (sDA) value of the space or building.	55 Percent	90 Percent

Materials Module	Base Case	Design Case
Building Material Embodied Carbon	0 Tonnes of CO_2eq	0 Tonnes of CO_2eq

Site	Base Case	Design Case
Recreation		New Open Space Biking, Picnic / Bench-sitting, Walking Trails, Running, Festivals or Performances, Visiting Arts & Crafts Fairs, Birdwatching / Nature, Flower Garden
Ground Cover	Parking Lot 50% Site Coverage (2.0 Acres) Material: Concrete SRI: 3.94	Parking Lot 10% Site Coverage (0.4 Acres) Material: Concrete SRI: 73.27
	Lawn 50% Site Coverage (2.0 Acres) Low Height Vegetation Managed: Yes	Lawn 30% Site Coverage (1.2 Acres) Low Height Vegetation Managed: Yes
		Shrubs & Trees 60% Site Coverage (2.4 Acres) Medium Height Vegetation Managed: No

Other Costs and Benefits	Base Case	Design Case
		Rent One-time Cost Benefit: -750000 Dollars

Interiors	Base Case	Design Case
View 1 no vegetation	100 Percent	0 Percent
View 2 no vegetation	0 Percent	0 Percent
View 3 no vegetation	0 Percent	10 Percent
View 4 no vegetation	0 Percent	10 Percent
View 5 no vegetation	0 Percent	80 Percent

View 1 with vegetation	0 Percent	0 Percent
View 2 with vegetation	0 Percent	0 Percent
View 3 with vegetation	0 Percent	0 Percent
View 4 with vegetation	0 Percent	0 Percent
View 5 with vegetation	0 Percent	0 Percent

Water Analysis	Base Case	Design Case
What is the amount of potable water used from a local utility?	1400000 Gallons	1050000.0 Gallons

Energy & Water Focus

Energy Module	Base Case	Design Case
Energy Efficiency	Base	30%

Mechanical	Base Case	Design Case
Ventilation		
What is the building ventilation rate?	17 cfm/person	17 cfm/person
Thermal Comfort		
Percent of employees who have access to thermal comfort controls	25 Percent	25 Percent
What is the setpoint temperature inside the building in the winter?	70 Degrees (Fahrenheit)	70 Degrees (Fahrenheit)
What is the setpoint temperature inside the building in the summer?	75 Degrees (Fahrenheit)	75 Degrees (Fahrenheit)
Filtration		
What is the MERV efficiency rating of your filters?	MERV rating: 6 Occupant Percent: 100%	MERV rating: 6 Occupant Percent: 100%

Life Cycle Cost Analysis Module	Base Case	Design Case

Electrical	Base Case	Design Case
Interior Lighting		
What percentage of employees have access to lighting controls?	25 Percent	25 Percent
Daylighting		
Indicate the proportion of employees (percent) that have access to daylighting during the day, or the spatial daylighting autonomy (sDA) value of the space or building.	55 Percent	55 Percent

Materials Module	Base Case	Design Case
Building Material Embodied Carbon	0 Tonnes of CO_2eq	0 Tonnes of CO_2eq

Site	Base Case	Design Case
Ground Cover	Parking Lot 50% Site Coverage (2.0 Acres) Material: Asphalt SRI: 3.94	Parking Lot 50% Site Coverage (2.0 Acres) Material: Asphalt SRI: 3.94
	Lawn 50% Site Coverage (2.0 Acres) Low Height Vegetation Managed: Yes	Lawn 50% Site Coverage (2.0 Acres) Low Height Vegetation Managed: Yes

Other Costs and Benefits	Base Case	Design Case
		Rent One-time Cost Benefit: -750000 Dollars

Interiors	Base Case	Design Case
View 1 no vegetation	100 Percent	100 Percent
View 2 no vegetation	0 Percent	0 Percent
View 3 no vegetation	0 Percent	0 Percent
View 4 no vegetation	0 Percent	0 Percent
View 5 no vegetation	0 Percent	0 Percent
View 1 with vegetation	0 Percent	0 Percent
View 2 with vegetation	0 Percent	0 Percent
View 3 with vegetation	0 Percent	0 Percent
View 4 with vegetation	0 Percent	0 Percent
View 5 with vegetation	0 Percent	0 Percent

Water Analysis	Base Case	Design Case
What is the amount of potable water used from a local utility?	1400000 Gallons	840000.0 Gallons

Appendix B

The following tables include: (i) general inputs, and (ii) location specific advanced inputs.

General Inputs

Input Name	Value	Unit
Project Type	Existing Building (Retrofit)	
Gross Floor Area of Building or Space	100,000	ft^2
Building Type	Administrative or Professional Office (100%)	
Site Area	4	Acres
Construction Start Date	12/08/2021	
Construction Duration	0.1	Years
Operations Duration	20	Years

Advanced Inputs

Financial Costs

Input Name	Value	Unit
Discounting		
Project Discount Rate	3	%
Energy Costs		
Electricity Utility Cost	0.0899	$/kWh
Electricity Price Forecasts	3.634	%
Carbon Price (Electricity Users)	0	$/tonnes
Natural Gas Utility Cost	7.6437	$/MMBtu

Natural Gas Price Forecasts	8.054	%
Carbon Price (Natural Gas Users)	0	$/tonnes
Water Costs		
Water Utility Cost	0.0051	$/Gallon
Growth in Price of Water	2.596	%
Wastewater Utility Cost	0.0048	$/Gallon
Growth in Price of Wastewater	2.9005	%
Currency		
Conversion Value of 1 US Dollar	1.3281	CAD

Social Costs

Input Name	Value	Unit
Social Cost of Carbon (CO_2e)	53.99	$/tonnes
Social Cost NO_x	10,605.96	$/tonnes
Social Cost SO_2	25,364.32	$/tonnes
Social Cost VOC_s	2,373.89	$/tonnes
Social Cost $PM_{2.5}$	257,447.77	$/tonnes
Social Value of Groundwater	932.63	$/Acre-foot
Social Value of Surface Water	19.72	$/Acre-foot

Emissions

Input Name	Value	Unit
Electricity		
NO_x	379.1188078	Tonnes/Million MWh
SO_2	518.9694094	Tonnes/Million MWh
VOC_s	6.20942772	Tonnes/Million MWh
CO_2e	602,439.76	Tonnes/Million MWh
$PM_{2.5}$	28.76606793	Tonnes/Million MWh
Grid Emission Projections for Electricity	Year Over Year Percent Change	
Expected reduction in carbon emissions per tonnes per million kWh of electricity	0	%
Natural Gas		
NO_x	54.786798	Tonnes/Million MMBtu
SO_2	0.266819	Tonnes/Million MMBtu
VOC_s	2.445839	Tonnes/Million MMBtu
CO_2e	53,363.7647	Tonnes/Million MMBtu
$PM_{2.5}$	2.534779	Tonnes/Million MMBtu
Expected reduction in carbon emissions per tonnes per million mmbtu of natural gas	0	%
Indoor Air Quality		
Local indoor $PM_{2.5}$ emissions	10.23133	$\mu g/m^3$
Local indoor PM_{10} emissions	31.3	$\mu g/m^3$

Occupants Inputs

Input Name	Value	Unit
Value of Statistical Life	9,691,577.38	$
Medical CPI Growth	2.00009	%
Annual non-accidental death rate	785.4	Deaths per 100,000 people
Administrative or Professional Office (100%)		
Expected Number of Employees in the Building	500	Employees
Average Annual Building Wage	105,538.43	$
Hours spent in the building	8	Hours
- Transient Occupants		
Number of Visitors per Day	50	Visitors/day
Average Time Spent per Visit per Day	2	Hours/day

Utility Inputs

Input Name	Value	Unit
From Ground Water Sources	100	%
From Surface Water Sources	0	%
Utility Providers Estimate of Wastewater Usage (as a Percent of Water Charges)	100	%
Electricity Usage for Supply of Utility Water	1,940	kWh/Million Gallons
Wastewater Treatment Process at Treatment Plant	Greater than secondary	

Electricity Usage for Wastewater Treatment by Treatment Plant	2,690	kWh/Million Gallons
Type of Storm Sewer System Connected to Site	MS4	
Percent of Storm Water Sent into Local Water Bodies	100	%
Percent Rainfall Leaving Site as Runoff (excluding on-site water capture)	100	%
Is wastewater being treated by an off-site wastewater treatment plant?	Yes	
Energy Analysis Type	Feature Comp	

Climate Inputs

Input Name	Value	Unit
Climate Change Scenario	RCP 4.5	
Number of Sunny Days	128	Days