National Aeronautics and Space Administration

NASA **Business Case Guide** for
Real Property and Facilities Project Investments

Business Case Guide

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1.0 Introduction and Purpose

1.1 Requirement for Business Cases

1.1.1 Requirement

The National Aeronautics and Space Administration (NASA) developed this Business Case Guide in accordance with NASA Headquarters' role in decision and policy making for real property and facilities within NASA. Business cases and the associated analyses for proposed facilities and real property projects ("Projects") are needed to ensure that NASA develops and controls the right set of facilities and infrastructure to support its mission. The requirement of a business case supports NASA's Real Property Asset Management Plan and the associated Real Property Management Goals as outlined in NPR 8820.2F (Facility Project Requirements) and NPR 7120.5D (NASA Program and Project Management Requirements).

1.1.2 OMB Requirement

The Office of Management and Budget (OMB) through OMB Circular A-11 (Preparation, Submission and Execution of the Budget) and A-94 (Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs) have stringent requirements for capital projects. The definitions of capital projects are outlined in OMB A-11 "Capital Program Guide" and Appendix "1 – Definition of Capital Assets." The concepts from OMB A-11 and A-94 are incorporated into this Business Case Guide.

1.1.3 Types of Projects Required to have a Business Case

All of NASA's facilities and real property projects are required to have a business case. These include proposed project involving land, structures, single facilities, a complex of facilities and structures, out-leases and disposition of underutilized facilities or land. Projects are divided into two categories:

- NASA Underutilized Facilities or Real Property – facilities, land, or other real property owned by NASA which may not be needed to immediately support current NASA Mission requirements. An underutilized facility that might be outleased to other government or private sector entities, or may be demolished to reduce NASA's costs. Underutilized land may include land at a NASA Center that is currently required for NASA's mission but may also be utilized by government or private sector entities in the near term.
- NASA Programmatic and Institutional Facilities Projects – facilities which NASA requires for use by NASA or NASA's contractors in the execution of NASA's mission. Typically these projects utilize Construction of Facilities (CoF) funds or in-leasing (NASA as tenant in non-NASA facilities).

1.2 Business Case Objectives

1.2.1 Decision-making: Transparent Business Objectives

The overriding purpose of a business case is to make transparent to the decision-making entities the objectives to be met by a real property action or a facilities investment. The business case should clearly articulate and the assumptions, costs and potential consequences of recommendations and alternative actions.

1.2.2 Support Expenditure of Capital Funds

A business case is the primary document supporting an expenditure of capital funds or other resources for real property or

This Business Case Guide was developed in accordance with NASA Headquarters' role in decision and policy making for real property and facilities within NASA.

facilities. The business case is a planning and decision-making support document that is needed to justify the acquisition of or improvement to a capital asset; to analyze a project's life cycle cost; and to mitigate risk. A business case supports investment decision involving what to buy, how much to spend, what returns to except, and when to implement. It presents the expected cash flow consequences of competing alternatives over time, and includes the assumptions used to quantify benefits and costs.

1.2.3 Consistent Systematic Approach

All business cases should be created and valued on similar and consistent set of guidelines in order to establish consistency in review and approval of proposed Projects and to ensure the best decisions for NASA is made consistently throughout the Agency. This business case guide describes a consistent 5-step process. For facilities projects (additions, alterations, modifications, rehabilitation, new facilities) regardless of NASA funding source NASA requires the use of a life-cycle cost tool developed by the United States Army Corps of Engineers (USACE), ECONPACK, to ensure that the economic analysis is consistent. ECONPACK is not required for real property projects (acquisition, disposal, leasing), however a financial analysis is required.

1.2.4 Elements of a Successful Business Case

This Guide describes a standard process for identifying and analyzing alternative solutions to meet the goals identified of the proposed project. A business case analysis should be accurate, clear and unbiased:

- Accurate – An effective business case should reflect the facts. All meaningful costs and all meaningful benefits should be included and validated against the best available data sources. Uncertainty and intangible factors should be captured, presented and analyzed consistently. Communicate all facts as part of the overall story.
- Clear – Business cases should be presented with succinct clarity and analyzed in a consistent manner. Where there are political considerations or where there exists a greater intrinsic benefit with a specific approach, then these biases should be made clear. Provide the reader with a vision of the end state.
- Unbiased – All meaningful alternatives should be presented and analyzed in a consistent manner. Where there are political considerations or where there exists a greater intrinsic benefit with a specific approach, then these biases should be made clear. Minimize jargon and conjecture. Demonstrate the value the project brings to NASA.

1.2.5 A Business Case is Designated to Answer Questions such as:

- What are the likely financial and other business consequences resulting from taking a particular action?
- Which alternatives represent the best business decision?
- Will the returns justify the investment?
- What will this action do for overall NASA mission performance?
- Why is the project being proposed?
- What is the scope of the project?
- How long will the project take?
- What are the risks of doing the project?
- What are the risks of not doing the project?
- How will the project success be measured?

NASA Business Case Five-Step Process:

1. Articulate the Project background or situation to be studied;
2. Describe the non-monetary considerations and criteria in making a decision;
3. Provide a description and financial analysis of alternatives;
4. Provide a summary of the results and recommendations; and
5. Develop and submit an executive brief to NASA decision-makers

- What are the alternatives?

1.3 NASA Business Case Five-Step Process

1.3.1 Thinking through the Five-Step Process

This guide will help you think through the process of creating a business case. There are five recommended sequential steps in the development of a NASA business case. The steps include:

1. a clear articulation of the Project background or situation to be studied;
2. a complete description of the non-monetary considerations and criteria to be considered when making a decision to ensure the best solution is chosen;
3. a complete description and financial analysis of alternatives that could potentially provide a good solution for NASA;
4. a summary of the results and recommendations; and
5. an executive brief, the document to be reviewed in depth by NASA decision makers, with both financial and non-financial considerations and a business justification of the final recommendation.

All five steps are to be documented and submitted to NASA, but the executive brief is the primary document that summarized the business case proposition. The business case submission process is described in Appendix "4.1 Business Case Submission."

1.4 How to Use This Guide

Although all real property and facilities projects require a business case based on NASA's five –step process, there are differences in the approach between real property projects and facilities projects. The processes are described in different sections of this report. Section 2 of this report outlines the five-step process for real property projects, and Section 3 outlines the five-step process for facilities projects.

This business case guide is intended to create consistency for all real property and facilities projects without being overly prescriptive or didactic. Therefore the processes described in the following two sections provide instructions and examples to help the writer create a project-specific business case that will address all of the major business issues in a logical and consistent manner.

This business case guide is intended to create consistency for all real property and facilities projects without being overly prescriptive or didactic.

2.0 Real Property Business Cases

2.1 Step 1 - Background

2.1.1 Overview

The single most important step in developing a business case is providing background and defining the problem. Without a succinct statement of what is to be investigated, it is not possible to make a rational decision about the appropriateness of a proposed solution. It is expected that the NASA team submitting this business case will extensively debate and discuss the project needs requirements; this section of the business case is the place where those discussions are documented. It is critical that this section address how the project relates to NASA's mission. Follow the outline below to describe key elements of the project.

2.1.2 Situation Summary

Describe background information that is important for a reviewer to understand including a description of why the project is being proposed. Specifically address how this project's need meets NASA's mission. For example:

NASA maintains buffer zone land for security reasons, and that need is expected to continue. The cost of maintaining the buffer zone is high. Several high security entities have expressed interest in occupying these areas and utilizing NASA's security as a benefit to their operations. If these companies were allowed to be on NASA land, the cost of maintaining the buffer zone could be shared, resulting in a decreased cost to NASA.

2.1.3 Project Goals / Requirements

Based on the situation described above, state the goals of the Project clearly, concisely, unbiased and, if possible, in quantitative terms. Clarity in this description will ensure that NASA reviewers have a better understanding of the project and its benefits.

2.1.4 Questions to Consider When Writing This Section:

- Is the stated problem the real problem?
- Is the objective unbiased and consistent with NASA's mission?

2.2 Step 2 - Non-Monetary Considerations

2.2.1 Overview

A business case should examine a well rounded analysis of both the financial implications of a particular alternative as well as other non-monetary considerations that are difficult to value in financial terms. These non-monetary considerations should be identified and re-verified by the NASA team proposing the project throughout the process of creating a business case.

2.2.2 Non-monetary Decision Criteria

Clearly and succinctly define criteria that should be considered when determining the best alternative. These criteria should be tied directly to the project goals outlined in Step 1. Thinking through all of the criteria up-front may also identify creative alternatives and problem solutions.

Defining and completely describing these decision criteria is required to be documented and justified. In Step 4, these non-monetary decision criteria will be weighted and measured along with the financial decision criteria to help guide decision making.

The decision criteria helps determine which alternative is "best for NASA". Examples of non-monetary decision criteria include:

- Better utilization of underutilized assets
- Reduce maintenance costs and deferred maintenance obligation

The single most important step in developing a business case is providing background and defining the problem.

- Improved image
- Increased opportunity for synergy with the private sector

2.2.3 Risks

Also conceived up-front and revisited throughout the creation of a business case is a succinct description of the risks that might be encountered in a project. These risks may be controlled by NASA or they may be outside of NASA's control. Clearly defining the risks, especially financial risks, will allow for better "sensitivity" analysis in Step 3, and will also allow the reader a to better understand the potential risks. Also describe the potential risk mitigation steps that might be taken. Example risk factors include:

- Tenant bankruptcy or vacates early (for outleasing)
  - Mitigation: find new tenant
- Enhanced Use Leasing (EUL) Partner failure
  - Mitigation: due diligence and projections in documents

The Risk Factors and their potential mitigation are to be fully described.

2.2.4 Questions to Consider When Writing This Section

- Are the non-monetary decision criteria clearly tied to the project requirements and NASA mission?
- Are all NASA stakeholder perceived risks and decision criteria stated?
- Are any of the decision criteria duplicative?

2.3 Step 3 - Alternatives

2.3.1 Overview

A complete range of potential alternatives that are well conceived, described, and supported by good assumptions will ensure that the best solutions for NASA are being considered.

2.3.2 Alternatives

Develop a complete list of alternative ways to meet the project goals and requirements. A "status quo" alternative is required. There may be a single of multiple alternatives for consideration. Appendix "4.3 – Alternatives" has a list of alternatives to consider.

The analysis should include as many alternatives that may meet the project requirements. Multiple alternatives that meet NASA's requirements will allow decision makers to make informed decisions about how your recommendation compares to the alternatives.

2.3.3 Assumptions

There are a variety of assumptions and estimates that must be made in forming a complete economic analysis. Major assumptions, source of data, and the data calculations must be documented, as they are very important in determining validity and accuracy.

Finance assumptions include "cost" and "benefits" categories. Each alternative may have many costs, such as acquisitions, construction, maintenance, utilities, services, supplies, personnel, National Environmental Protection Act (NEPA), etc. Some real property projects may also have financials "benefits" in the form of EUL proceeds, in-kind considerations, or other value benefits to NASA. In the financial analysis, these items should be clearly indentified:

- Positive Cost: A cost is the value of a resource – labor, materials, services, etc.
- Benefit or Negative Cost: Negative costs are monetary benefits such as the salvage value of a building. Salvage

A complete range of potential alternatives that are well conceived, described, and supported by good assumptions will ensure that the best solutions for NASA are being considered.

value is a subtraction in the summation of all costs in an economic analysis. Revenues to NASA from out leasing activities are also considered negative costs

All financial aspects of each alternative needs to be accurately captured including inflation and discount rates (refer to the current OMB guidance), lease termination dates, move costs, leasing fees, construction cost, location factors, and inflation, the estimated useful life of an asset, the replacement time for a building component such as a roof, and the future cost of a required repair action. Costs must be determined and included for the entire life of the project or study period to reflect total life-cycle costs. If an asset is to be owned, include a terminal value as a benefit in the last year of the analysis.

Unless there is a reason to use a different timeframe, the financial analysis timeframe should be thirty (30) years.

The economic analysis requires that the amount and timing of all costs be determined for each alternative including recurring costs such as annual Operations and Maintenance Costs (O+M).

"Appendix 4.2 – ECONPACK", Attachment B includes some financial assumptions that may be considered when creating the financial analysis.

2.3.4 Cost Sensitivity

Based on the risks indentified in Step 2, test the financial risk and the impact of large uncertainties in costs or benefits on the ranking of the alternatives. This is particularly important if the results of the analysis do not clearly favor any one alternative, or there is a great deal of uncertainty about a cost, benefit, or assumption in the economic analysis.

2.3.5 Questions to Consider When Writing This Section

- Is the level of detail in estimating the costs and benefits appropriate given the available project details?
- Are all relevant costs and benefits included?
- Are the sources of cost data indicated?
- Were escalation projections and discount rates derived from the appropriate OMB resources?
- Was present value analysis properly performed?
- Is terminal value important in this analysis?
- If lead time differs between alternatives, have the economic lives been aligned?
- Has break-even analysis been performed and are the results logical?
- Have all relevant "what if" questions been answered?
- Have potential changes to dominant cost elements been used in a sensitivity analysis and are the results logical?
- What do the sensitivity analysis results imply about the relative ranking of alternatives?
- Is the final ranking of the alternatives financially logical?

2.4 Step 4 - Results and Recommendations

2.4.1 Overview

After completing the economic modeling of the Alternatives in Step 3, analyze the information gathered to date and document the results and recommendations. There are three interrelated activities that are required in this step:

- Analyzing the life-cycle costs
- Analyzing the initial costs
- Creating a decision matrix

Three-step process for determining results and recommendations:

1. Analyzing the life-cycle costs
2. Analyzing the initial costs
3. Creating a decision matrix

2.4.2 Life Cycle Cost

Based on the financial analysis for each alternative from Step 3, documents and compare the Net Present Value (NPV) of the life-cycle costs of each Alternative. Review the results and provide any additional insights.

2.4.3 Initial Cost Estimates

Prepare an estimated "initial project cost" summary that reflects the amount of funds required up front, excluding recurring annual costs. Review the results and provide any additional insights.

2.4.4 Decision Matrix

NASA has created a relatively simple Microsoft Excel-based tool that arrays the economic and decision factors for each of the alternatives to help guide decision-making. This tool is described in greater detail in Appendix "4.4 – Decision-Matrix Template." The decision matrix is designed to summarize a great deal of thinking and discussion in a relatively simple format. To complete the decision matrix:

1. Input the alternatives considered along the top row. The alternatives should match the alternative names from Step 3
2. Input the non-monetary decision criteria in the left column. The non-monetary decision criteria should match the decision criteria discussed in Step 2
3. Weight the financial decision criteria, so that both Life Cycle Cost and Initial Cost values together equal 100%
4. Weigh the non-monetary criteria so that all decision criteria together equal 100%
5. Assign a score to each alternative for the non-monetary decision criteria and the financial criteria. The scores should be:

   -1= does not meet factor criteria, or is more costly than alternatives

   0 = meets factor criteria, or has reasonable costs compared to alternatives

   +1 = exceeds factor criteria, or is least costly than alternatives

2.4.5 Recommendation

Based on the information above, succinctly describe the recommendation and business rationale for that alternative.

2.4.6 Questions to Consider When Writing This Section

- Are the recommendations logically derived from the material?
- Are the recommendations feasible in the real world of political, cultural, or policy considerations?
- Are the recommendations based upon significant differences between the alternatives?
- Do benefits exceed costs for alternatives considered?
- How will NASA measure success?

2.5 Step 5 - Executive Brief

2.5.1 Overview

The Executive Brief is the primary document which summarizes the business justification for the project to be reviewed by NASA decision-makers. It should be a 2-3 page document written in MS Word, summarizing the findings from steps 1-4. The Executive Brief should be succinctly written and provide an overview of the project, the results, and recommendation.

2.5.2 Outline

Please use the outline provided below:

1. Project Background and Objectives

The Executive Brief is the primary document which summarizes the business justification for the project.

Summarize the project requirement including the need for a solution to the situation, project objectives, and how the project supports NASA's mission

2. Alternatives Considered

Briefly describe the alternatives considered, and, describe other logical alternatives that were not considered or considered non-viable and completely explain why they were not considered.

3. Non-Monetary Considerations and Decision Matrix

Describe the non-monetary and financial decision criteria and their respective weights, including why the highest weighted criteria outweigh other decision criteria. Describe the results of the decision matrix analysis.

4. Recommendation

Present your recommendation, and requested next steps.

5. Attachments

Two attachments should accompany the Executive Brief: (1) The financial analysis and supporting materials from Steps 1-4, and (2) a copy of the decision matrix.

2.5.3 Questions to Consider When Writing the Executive Brief

- Is the summary accurate, concise, and understandable?
- Does the Executive Brief summarize all relevant factors that a reader could find going through the detailed analysis?

The Executive Brief should follow the outline below:

1. Project Background and Objectives
2. Alternatives Considered
3. Non-Monetary Considerations and Decision Matrix
4. Recommendations
5. Attachments

3. Facilities Business Cases

The five-step process for creating a business case described previously is also to be used on facilities projects. Most facilities projects are required to use the latest version of ECONPACK. This section will describe the process for writing a Business Case using ECONPACK software.

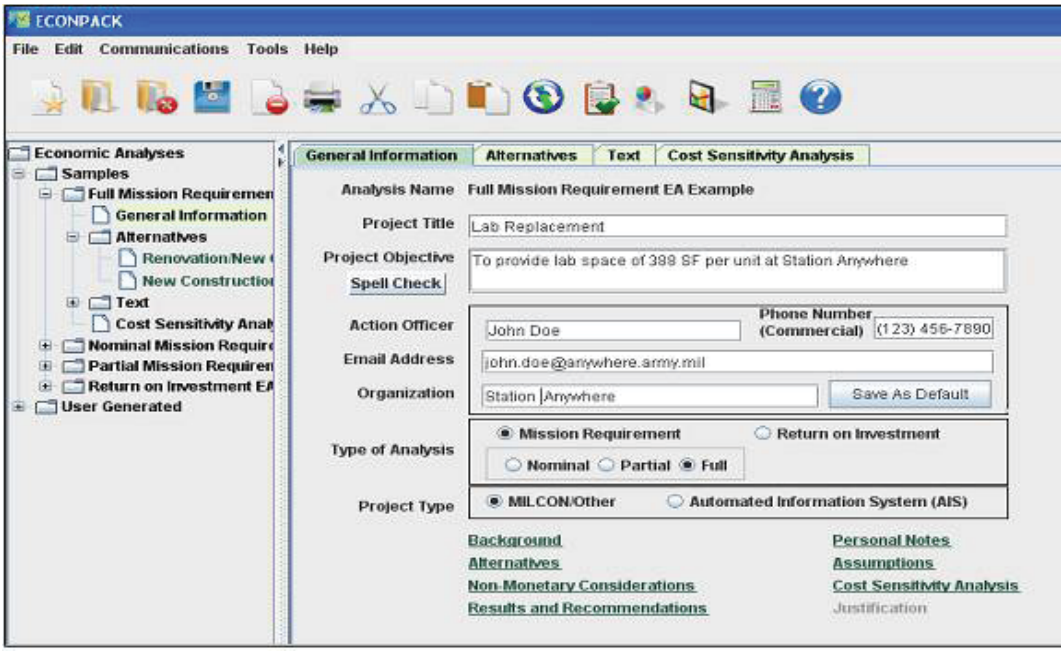
The United States Army Corps of Engineers (USACE) has developed a software package named ECONPACK that integrates many elements required in a facilities business case. NASA is utilizing this software as the primary financial calculator and repository for much of the business case data. Utilization of ECONPACK will allow NASA the consistency and rigor required to ensure a well rounded analysis and OMB compliance. All business cases must use ECONPACK unless an alternative is approved in advance by **NASA Headquarters Facility Engineering Division**.

The program relies on three economic principles:

- All reasonable alternative methods of meeting an objective must be considered.
- Each alternative must be evaluated in terms of its total expected life (life-cycle costs).
- The value of money changes over time; costs and benefits are adjusted to bring them to one point in time for a valid comparison.

The first four steps of the business case process are designed to easily be documented in ECONPACK. When opening ECONPACK and starting a new project under the File dropdown menu, the following image will be displayed which includes the terms described in the first four steps. ECONPAK users will need to be prepared to input costs and benefits

Most facilities projects are required to use the latest version of ECONPACK, a software package that integrates many elements required in a facilities business case.



information associated with a proposed project along with general assumption related to a life cycle cost analysis.

For more detailed instruction in how to utilize the ECONPACK software, refer to Appendix "4.2 – ECONPACK Software Manual (NASA Specific)."

3.1 Step 1 - Background

3.1.1 Overview

The single most important step in developing a business case is providing background and defining the problem. Without a succinct statement of what is to be investigated, it is not possible to make a rational decision about the appropriateness of a proposed solution. It is expected that the NASA team submitting this business case will extensively debate and discuss the project needs requirements; this section of the business case is the place where those discussions are documented. It is critical that this section address how the project relates to NASA's mission. Follow the outline below to describe key elements of the project.

When opening a new project in ECONPACK there is a tab labeled "Background" that opens up a blank text sheet; utilizing that venue, follow the outline below to describe key elements of the project:

3.1.2 Situation Summary

Describe background information that is important for a reviewer to understand, including a description of why the project is being proposed. Specifically address how this project meets NASA's mission. For example:

NASA's current research focus on the effects of MicroGravity over long periods of time will be conducted at this Center because of the number and capabilities of the specialized test facilities located here. The Center, however, has fully committed laboratory buildings and requires additional capacity.

3.1.3 Project Goals / Requirements

Based on the situation described above, state the goals of the Project clearly, concisely, unbiased and, if possible, in quantitative terms. Clarity in this description will ensure that NASA reviewers have a better understanding of the project and its benefits. Depending on the specific project being proposed, examples of Project aspects to be described to include in this section are:

- Size, space, and performance criteria for the project
- Buildings or sites which relate the project
- "What if" ramifications of not doing the project
- How the project specifically relates to NASA's mission purpose

3.1.4 Questions to Consider When Writing This Section

- Is the stated problem the real problem?
- Is the objective unbiased and consistent with NASA's mission?

3.2 Step 2 - Non-Monetary Considerations

3.2.1 Overview

A business case should examine a well rounded analysis of both the financial implications of a particular alternative as well as other intangible non-monetary considerations that are difficult to value in financial terms. These non-monetary considerations should be identified and re-verified by the NASA team proposing the project throughout the process of creating a business case. In ECONPACK there is a tab labeled "Non-Monetary Considerations" that opens up a blank text sheet; utilizing that venue, follow the outline below to describe the non-monetary considerations.

The single most important step in developing a business case is providing background and defining the problem.

3.2.2 Non-monetary Decision Criteria

Clearly and succinctly define non-monetary decision criteria that should be considered when determining the best alternative. These criteria should be tied directly to the project goals outlined in Step 1. Thinking through all of the criteria up-front may also identify creative alternatives and problem solutions.

Defining and completely describing these decision criteria is required to be documented and justified. In Step 4, these factors will be weighted and measured, along with the financial decision criteria, to help guide decision making.

The decision criteria helps determine which alternative is "best for NASA". Examples of non-monetary decision criteria include:

- Increased science capabilities to support X mission
- Improved employee morale
- Improved image
- Back-up redundancy for 24/7 operations decoupled with Center infrastructure
- Maximum flexibility to accommodate mission changes

3.2.3 Risks

Also conceived up-front and revisited throughout the creation of a business case is a succinct description of the Risks that might be encountered in a project. These risks may be controlled by NASA, or they may be outside of NASA's control. Clearly defining the risks, especially financial risks, will allow for better "sensitivity" analysis in Step 3 and will also allow the reader to better understand the potential reality of the risks. Also describe the potential risk mitigation steps that might be taken. Example risk factors include:

- Construction cost increase
  - Mitigation: reduce space
- Schedule extension
  - Mitigation: temporary use of other asset
- Natural disaster (Tornado, Hurricane, etc)
  - Mitigation: funds required for repair

The Risk Factors and their potential mitigation are to be fully described.

3.2.4 Questions to Consider When Writing This Section

- Are the non-monetary decision criteria clearly tied to the project requirements and NASA mission?
- Are any of the decision factors duplicative?

3.3 Step 3 - Alternatives

3.3.1 Overview

A complete range of potential alternatives that are well conceived, described, and supported by good assumptions will ensure that the best solutions for NASA are being considered. ECONPACK provides detailed prompts that support creation of the alternatives and creating the financial model for each alternative. There are several elements that are required in defining and modeling the alternatives:

3.3.2 Alternatives

Develop a complete list of alternative ways to meet the project goals and requirements. A "status quo" alternative is required. There may be a single or multiple alternatives for consideration. Appendix "4.3 – Alternatives" has a list of alternatives to consider.

The analysis should include multiple alternatives. For example, include alternatives that may support sustainable design over lowest cost; use of existing

A complete range of potential alternatives that are well conceived, described, and supported by good assumptions will ensure that the best solutions for NASA are being considered.

NASA infrastructure, disposition / demolition, or renovating; purchasing or leasing an existing facility versus designing and constructing a new facility. Multiple alternatives will allow decision makers to better understand the potential consequences of facilities investment decisions and to make informed choices in regard to owning, leasing, reinvesting in, disposing of, or constructing facilities. When developing a building systems level project, consider different technical approaches for comparison.

3.3.3 Assumptions

There are a variety of assumptions and estimates that must be made in forming a complete economic analysis. There is a venue in ECONPACK to easily provide justification for each assumption. Major assumptions, source of data, and the data calculations must be documented, as they are very important in determining validity and accuracy.

Financial assumptions can generally be broken into "cost" and "benefits" categories. Each alternative may have many costs, such as construction, maintenance, utilities, services, supplies, personnel, etc. It is possible that facilities projects have revenues, or "benefits" which reduce the costs. In ECONPACK, costs can be positive or negative.

- Positive Cost: A cost is the value of a resource – labor, materials, services, etc.
- Negative Cost ("Benefits"): Negative costs are monetary benefits such as the salvage value of a building. Salvage value is a subtraction in the summation of all costs in an economic analysis. Revenues to NASA from out leasing activities are also considered negative costs in ECONPACK

All financial aspects of each alternative needs to be accurately captured including inflation and discount rates (referring to the current OMB guidance), lease termination dates, move costs, leasing fees, construction cost, location factors, and inflation, the estimated useful life of an asset, the replacement time for a building component such as a roof, and the future cost of a required repair action. Costs must be determined and included for the entire life of the project or study period to reflect total life-cycle costs.

Unless there is a reason to use a different timeframe, the financial analysis timeframe should be thirty (30) years.

The economic analysis requires that the amount and timing of all costs be determined for each alternative including recurring costs such as annual Operations and Maintenance Costs (O+M).

ECONPACK will automatically calculate the life-cycle costs associated with each alternative.

3.3.4 Cost Sensitivity

Based on the risks indentified in Step 2, test the financial risk and the impact of large uncertainties in costs or benefits on the ranking of the alternatives. This is particularly important if the results of the analysis do not clearly favor any one alternative, or there is a great deal of uncertainty about a cost, benefit, or assumption in the economic analysis.

3.3.5 Recommendation

Based on the information above, succinctly describe the recommendation and business rationale for that alternative.

3.3.6 Questions to Consider When Writing This Section

- Is the level of detail in estimating the costs and benefits appropriate given the available project details?

All financial aspects of each alternative needs to be accurately captured.

- Are all relevant costs and benefits included?
- Are the sources of cost data indicated?
- Were escalation projections and discount rates derived from the appropriate OMB resources?
- Were all financial elements accounted and placed into ECONPACK?
- Was present value analysis properly performed?
- Is terminal value important in this analysis?
- If lead time differs between alternatives, have the economic lives been aligned?
- Has break-even analysis been performed and are the results logical?
- Have all relevant "what if" questions been answered?
- Have potential changes to dominant cost elements been used in a sensitivity analysis and are the results logical?
- What do the sensitivity analysis results imply about the relative ranking of alternatives?
- Is the final ranking of the alternatives financially logical?

3.4 Step 4 - Results and Recommendations

3.4.1 Overview

After completing the economic modeling of the Alternatives in Step 3, analyze the information gathered to date and document the results and recommendations. There are three interrelated activities that are required in this step:

- Analyzing the life-cycle costs
- Analyzing the initial costs
- Creating a decision matrix

In ECONPACK there is a tab labeled "Results and Recommendation" that opens up a blank text sheet; utilizing that venue, follow the outline below to describe the results and recommendations

3.4.2 Life Cycle Cost

After inputting the financial considerations under each alternative in Step 3, ECONPACK will automatically prepare financial results in a Net Present Value (NPV) comparison that includes life-cycle costs of each Alternative. Review the results and provide any additional insights.

3.4.3 Initial Cost Estimates

Using the key data inputted into ECONPACK and other resources (including Form 1509 and Backup), prepare an estimated "initial project cost" summary that reflects the amount of funds required up front, excluding recurring annual costs. These funds typically include hard and soft costs for CoF projects. Review the results and provide additional insights.

3.4.4 Decision Matrix

NASA has created a relatively simple Microsoft Excel-based tool that arrays the economic and decision criteria for each of the alternatives to help guide decision-making. This tool is described in greater detail in Appendix "4.4 – Decision-Matrix Template". Although the decision matrix will not be automatically printed in ECONPACK, findings should be discussed by the preparer in ECONPACK. The decision matrix is designed to summarize a great deal of thinking and discussion in a relatively simple format. To complete the decision matrix:

1. Input the alternatives considered along the top row. The alternatives should match the alternative names from Step 3
2. Input the non-monetary decision criteria in the left column. The non-monetary

The decision matrix is designed to summarize a great deal of thinking and discussion in a relatively simple format.

decision criteria should match the decision criteria discussed in Step 2

3. Weight the financial decision criteria, so that both Life Cycle Cost and Initial Cost values together equal 100%
4. Weigh the non-monetary criteria so that all decision criteria together equal 100%
5. Assign a score to each alternative for the non-monetary decision criteria and the financial criteria. The scores should be:

   -1= does not meet factor criteria, or is more costly than alternatives

   0 = meets factor criteria, or has reasonable costs compared to alternatives

   +1 = exceeds factor criteria, or is least costly than alternatives

3.4.5 Recommendation

Based on the information above, succinctly describe the recommendation and business rationale for that alternative.

3.4.6 Questions to Consider When Writing This Section

- Are the recommendations logically derived from the material?
- Are the recommendations feasible in the real world of political, cultural, or policy considerations?
- Are the recommendations based upon significant differences between the alternatives?
- Do benefits exceed costs for alternatives considered?
- How will NASA measure success?

3.5 Step 5 - Executive Brief

3.5.1 Overview

The executive brief is the primary document which summarizes the business justification for the project to be reviewed by NASA decision-makers. It should be a 2-3 page document written in MS Word (not ECONPAK), summarizing the findings from steps 1-4. The Executive Brief should be succinctly written and provide an overview of the project, the results, and recommendation.

3.5.2 Outline

Please use the outline provided below:

1. Project Background and Objectives

Summarize the project requirement including the need for a solution to the situation, project objectives, and how the project supports NASA's mission

2. Alternatives Considered

Briefly describe the alternatives considered in, and describe other logical alternatives that were not considered or considered non-viable and explain why they were not considered.

3. Non-Monetary Considerations and Decision Matrix

Describe the non-monetary and financial decision criteria and their respective weights, including why the highest weighted criteria outweigh other decision criteria. Describe the results of the decision matrix analysis.

4. Recommendation

Present your recommendation, and requested next steps.

5. Attachments

Two attachments should accompany the Executive Brief: (1) A copy of the ECONPACK report completed in Steps 1-4 above which can be printed through ECONPACK, and (2) a copy of the decision matrix.

The Executive Brief should be succinctly written and provide an overview of the project, the results, and recommendation.

3.5.3 Questions to Consider When Writing This Section

- Is the summary accurate, concise and understandable?
- Does the Executive Brief summarize all relevant factors that a reader could find going through the detailed analysis?

Consider accuracy, conciseness, understandability when writing this section.

4. Appendix

4.1 Business Case Submission

Facilities and real property proposals are required to be submitted to NASA Headquarters for approval. Business cases will be reviewed by several Headquarter personnel, although the primary reviewers will specialize in one of the following two projects types:

- NASA underutilized Facilities or Real Property (Technical Capabilities and Real Property Management Division, Office of Strategic Infrastructure)
- NASA Mission (Programmatic and Institutional) facilities projects, such as CoF projects (Facilities Engineering Division, Office of Strategic Infrastructure)

For facilities projects, follow the submission process in the current NASA Policy Requirement (NPR) regarding annual budget guidance.

Upon receipt, NASA headquarters personnel will evaluate the business case and respond with feedback.

4.2 ECONPACK Software Manual

Developed and modified by USACE.

Construction of Facilities (CoF) Program Projects

All Discrete and Minor CoF projects must have an ECONPACK Economic Analysis:

Primary Analysis: Primary analysis will be used for analyzing all project alternatives in which the status quo is a viable option, and will include any and all (as appropriate) Savings to Investments Ratio (SIR), or Discounted Payback Period (DPP) results.

Secondary Analysis: Secondary analysis will be used for analyzing all project alternatives for which the status quo is not viable for new requirement. Secondary analysis will not have cost savings; however, will be evaluated upon which alternative is the least amount (least net present value) over the life of the asset.

Project Viability: For projects to be considered viable in Primary Analysis, SIR should be 1.5 or greater (SIR of 1.0 indicates that savings are equal to investment), and DPP should be in the single digits. Projects not meeting these criteria must have a compelling written justification that can overcome their lack of economic viability. An alternative facilities solution is recommended for any project being developed that shows a DPP greater than 15 years.

Discount Rate: OMB Circular A-94, Appendix C (Dec 2009), <http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html> (attached), provides real interest rates used for discounting real (constant dollars) flows for cost effectiveness analysis. These real interest rates (based on the economic assumptions within the OMB budget) are presented below.

Real Interest Rates (tentative) on Treasure Notes and Bonds of Specified Maturities (in percent). Refer to the OMB website for current rates.

Analyses different from those presented above may use a linear interpolation e.g., a 4-year project can be evaluated with a rate equal to the average of the 3-year and 5-year rates. Projects with durations longer than 30 years may use the 30-year interest rate.

Business cases will be reviewed by NASA personnel specializing in NASA underutilized Facilities or Real Property and NASA Mission facilities projects.

Multi-phased Projects: Projects phased over a few years, are to have their analysis conducted for all phases combined.

Objective: Economic analysis objectives will be stated in clear, concise, unbiased, and quantitative (to the extent possible) terms.

Discounting Conventions: For all costs use Middle-Of-Year (M-O-Y) conventions, and for residual values use End-Of-Year (E-O-Y) conventions.

Period of Analysis: Usually 25 Years + Lead Time (construction time)

Start/Base Years: The Program Year for which the project is planned. Costs should be estimated using current price levels.

Constant Dollars: Should be a constant dollar analysis, using the real discount rate (no inflated numbers).

Salvage Value Calculations: For New Construction, the Physical Life is 40 years, the method is Straight-Line, and the Begin Year is the year after the facility is completed, discounting convention is end of year, and constant dollars are applied. Renovation is the same, except the Physical Life is only 25 years. Where Land residual values are being claimed, the Land appreciation begins in the first year of the analysis.

Alternatives Explored and Discussed: The analysis must consider and document, at minimum, each of the following alternatives.

1. Status Quo (do nothing)*
2. New Acquisition or Construction
3. Leasing
4. Modification of existing assets, i.e., renovation, upgrade, expansion, etc
5. Use of Other Government Facilities
6. Mix (i.e., New Construction + Renovation)
7. Privatization (required for utility systems);

To provide a common footing for all projects, the status quo alternative should always be considered and include a full quantitative consideration of the costs of doing nothing. In the past years, some Centers declared the status quo alternative as non-feasible and did not provide a quantitative evaluation of the potential costs of doing nothing. This frequently resulted in very low differences in Net Present Value between the selected project alternative and the next best alternative explored, relative to the project cost estimate. The low apparent cost savings weakened the perceived merit of the project relative to other similar projects that did provide a comparison to the status quo alternative.

Savings: Total present value of savings will be determined in Primary analysis only. Secondary analysis will not have savings and will be determined on least cost alternative (cost avoidance).

Utilities Costs: Utility costs should be provided for each alternative (actual in the case of the Status Quo) and estimates (documenting sources) for other alternatives. Each situation should be assessed individually.

Construction Costs: Usually, initial construction costs are evenly divided throughout the lead (construction) time.

Imputed Costs: When there is a feasible private lease option in the analysis, or other Government-owned alternatives should have imputed costs (insurance, real estate taxes, and land) included, per OMB Circular A-94.

Wash Costs: Costs that are equal (magnitude and timing) across all alternatives can be deleted from the life cycle cost report; however, all washed costs are to be discussed in the Assumption section.

To provide a common footing for all projects, the status quo alternative should always be considered and include a full quantitative consideration of the costs of doing nothing.

Assumptions: Should contain information such as the sources of the discount rates, residual/salvage calculation parameters, important data concerning the project, assumptions concerning the scope of the project, etc. Cost assumptions must be clearly specified and should include; site surveys and site soils and geology investigations, engineering design, studies, construction, collateral/non-collateral equipment, operations (including utilities) and maintenance (including potential modifications and restoration), component or facility failures, and facility downtime, all based on Center's operational experience. **Sustainable Project Design should be specifically addressed.** Wash costs are also to be discussed.

Results and Recommendations (Discussion): A recommendations (with justification) should be provided. Although the primary criterion for selecting a project is least cost (i.e., lowest net present value), an alternative that is not least cost may be selected based on other factors.

Cost Sensitivity Analysis: Must be performed; vary initial investment cost and all associated costs of the selected project alternative up and down by at least 25 percent, and keep the next closest alternative constant (do not vary the costs).

Discount Rate Sensitivity Must be performed; apply to all alternatives, and vary the rate up and down by at least 25 percent.

Non-Monetary Benefits: Should discuss, if applicable.

Source and Derivation of Costs: Emphases required for the most critical part of the analysis; must check for accuracy and logic. An "audit" trail and explanation for each cost must be provided in the analysis; for example: Utilities – Includes all water, sewer, gas and electric **associated with the project.**

When there is only one feasible option: Must contain the project objective, a description and listing of the alternatives considered, and a recommendation; this must be completed, even though a full-blown analysis is not necessary.

Additional Paragraph: Should contain one of the following sets of statements:

1. An economic analysis has been prepared and utilized in evaluating this project.
2. Alternative methods of meetings this requirement have been explored during project development. This project is the only feasible option to meet the requirement.

4.3 Alternatives to be Considered

- Status Quo - **(Current Operations)**: The status quo alternative assumes that existing facilities will continue to be used in their current state to meet the requirement and that routine maintenance will continue to be performed (including any necessary upgrades to remain "code and safety" compliant). The status quo alternative constitutes the baseline against which all other alternatives are evaluated. The alternatives considered will be evaluated based upon how much better (dollar savings and non-monetary considerations) they are than the current (status quo) situation.
- Renovation - This alternative involves a change to the interior or exterior of a facility to improve its current use. This can include installed equipment that is made a part of the existing facility. Depending on the cost Renovation can be classified as minor or major but keep in mind the need to distinguish between this alternative and the alternative

Alternatives to be Considered:

- Status Quo
- Renovation
- Renovation/New Construction Mix
- New Construction
- In-Leasing
- Other Land/Facilities on Center
- Other Land/Facilities within NASA
- Outsourcing (Contracting Services out)
- Public Private Partnership
- Demolition

immediately below, Renovation/ New Construction Mix, if the renovation involves changes to the exterior.

- Renovation / New Construction Mix - This alternative involves a renovation to a real property facility that adds to the overall external dimensions. Interior renovation only does not fall under this alternative.
- New Construction - A new construction project is considered a single undertaking to produce a complete and usable facility. It includes all construction work including demolition if applicable, land acquisition (if necessary), supervision, inspection and overhead costs, and procurement and installation of specific types of built-in equipment necessary to make a facility complete and usable. If applicable, the value of materials that can be salvaged from demolition should be included in the analysis as the sale of such materials can help offset the cost of this alternative.
- In-Leasing –This alternative analyzes the impact of NASA leasing a commercial facility for its NASA's use. When leasing facilities is an alternative in an economic analysis, certain aspects of the analysis and costs involved are different from those of a traditional economic analysis. The purpose of this alternative which could be related to a lease-versus-buy analysis is to determine whether it would cost less to lease or to construct (buy) an asset. All costs associated with leasing space (including build-out or remodeling of the interior, commission costs, occupancy expense, moving, etc.) should be included.
- Other Land/Facilities on Center – Under this alternative, other facilities or land should be considered as options for the business case project to take into account the potential of utilizing existing available land/facilities on location to potentially reduce cost, provide an optimum location or take advantage of underutilized facilities to meet the project needs. All cost associated with utilizing other land or facilities at the Center including any changes that need to be made should be considered under this alternative.
- Other Land/Facilities within NASA – Similar to the alternative immediately above, this alternative considers existing land and facilities that could be options for the project which exist within the NASA portfolio of facilities and real property instead of just at the Center. All cost associated with utilizing other land or facilities within NASA including any changes that need to be made to the property should be considered under this alternative. This alternative may not be applicable to some scenarios depending on the project's function and its relationship to other Center activities.
- Outsourcing (Contracting Services out) – This alternative takes into account the costs to NASA or a Center to outsource the service or need of the project. Such an alternative presents the reviewers with the comparison of keeping the project in-house versus the cost associated with a focused third party group providing a service or project execution as it relates to a mission. This alternative may not be applicable to some scenarios. An example of this alternative is an OMB A-76 process.
- Public Private Partnership – This alternative covers a broad variety of scenarios where a third party to NASA may provide a facility or other benefit to NASA, but NASA will still maintain

Public Private Partnership scenarios:

- NASA is offered a facility for a NASA use that is partially or wholly funded by a third party.
- NASA enters into an agreement with a third party for use of an underutilized asset which will be improved for third party's use.
- NASA enters into an agreement with a third party for construction of an asset of which NASA will be the primary users.

some involvement. A few examples include:

- NASA is offered a facility for a NASA use that is partially or wholly funded by a third party such as a state economic development authority. In this example, although NASA may not be responsible for initial funding, NASA may be responsible for ongoing operating expenses or capital/renovation costs as the facility ages.

- NASA enters into an agreement with a third party for use of an underutilized asset which will be improved for third party's use; NASA may have additional costs associated with the third party's use of the facility, or may be required to remove some of the improvements that have been made.

- NASA enters into an agreement with a third party for construction of an asset of which NASA will be the primary users. This may result in a "capital" lease and require budgetary scoring.

- Demolition – This alternative takes into account all costs associated with ceasing all functions within the facility, dismantling any necessary portions of a facility, demolition of any structure or moving any earth that is necessary to leave the land in a condition suitable to NASA. The value of materials that can be salvaged should be included in the analysis as the sale of such materials can help offset the cost of this alternative.

- Outleasing – When NASA has an underutilized facility or portion of a facility or land, out-leasing to a government entity or to a private entity should be considered as an alternative. All costs associated with out-leasing NASA real property or facilities should be included. For example, cost such as but not limited to remodeling the space, commission costs, shared occupancy costs, occupancy charge revenue, impact on the value of the asset. In most cases these consideration will be controlled by the type of authority that is considered best to allow a NASA center to lease to another party.

- Other Creative Alternatives:

  - Innovative Alternative or Combination of the Alternatives - It may be possible to consider combinations of alternatives listed above. For example, in a project that includes multiple analysis of multiple facilities that are being proposed, several viable alternatives might include:

    - Renovation of existing facilities to incorporate support of the entire business case project
    - New construction on-site plus leasing off-site
    - Construction of new facilities that connect multiple existing facilities together into one larger existing, renovated or new facility

A combination of alternatives may be considered for a project that includes multiple analysis of multiple facilities that are being proposed, a combination of alternatives .

4.4 Decision-Matrix Template

NASA Business Case Decision Matrix

Steps to completing the Decision Matrix:

Input cells are **Bold Blue** in the table below. All other cells are not to be changed.

Step 1 Input the names of each **Alternative** (1-7, if applicable) along the top row

Step 2 Input **Decision Criteria** (1-6,if applicable) in column under "Non-Monetary Criteria"

Step 3 Assign weights to the financial criteria (in **Percentage**) adding up to 100%

Step 4 Assign weights to the Non-Monetary criteria (in **Percentage**) adding up to 100%

Step 5 Assign a **-1, 0, or +1 score** to each alternative and criteria

-1 = does not meet factor criteria or is more costly than alternatives

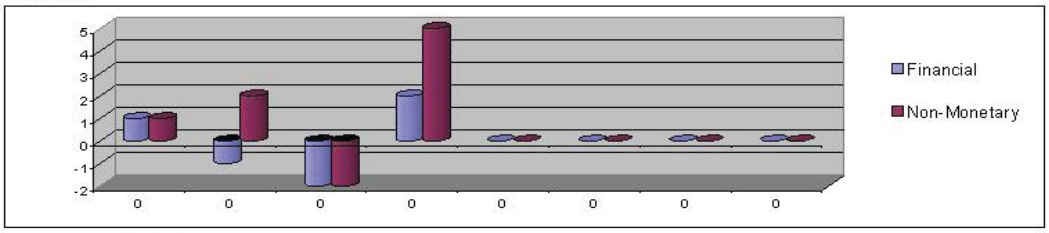
0 = meets factor criteria or has reasonable costs compared to alternatives

+1 = Exceeds factor criteria or is least costly than alternatives

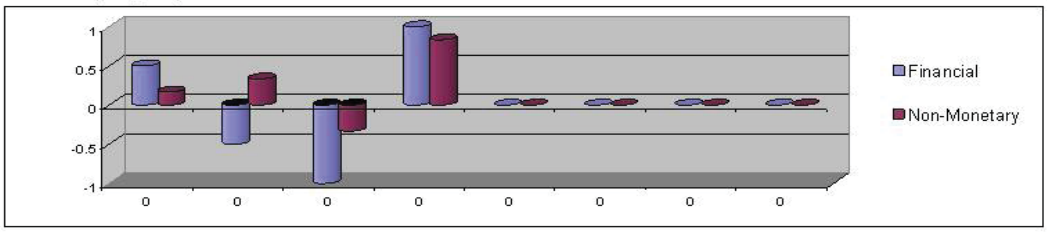
ASSUMPTIONS

Alternative Name (Step 1)		Status Quo	Input Alternative 1	Input Alternative 2	Input Alternative 3	Input Alternative 4	Input Alternative 5	Input Alternative 6	Input Alternative 7
		0	1	2	3	4	5	6	7
		Raw Score: (Step 5)							
Financial Criteria	Weight (Step 3)								
Initial Cost	**50%**	**0**	**0**	**-1**	**1**	**0**	**0**	**0**	**0**
Life Cycle Cost (NPV)	**50%**	**1**	**-1**	**-1**	**1**	**0**	**0**	**0**	**0**
Total Financial Criteria	100%	1	-1	-2	2	0	0	0	0
Non-Monetary Criteria (Step 2)	Weight (Step 4)								
Input Decision Criteria 1	**17%**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**
Input Decision Criteria 2	**17%**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
Input Decision Criteria 3	**17%**	**1**	**0**	**-1**	**1**	**0**	**0**	**0**	**0**
Input Decision Criteria 4	**17%**	**0**	**1**	**-1**	**0**	**0**	**0**	**0**	**0**
Input Decision Criteria 5	**17%**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
Input Decision Criteria 6	**17%**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
Total Non-Monetary Criteria	100%	1	2	-2	5	0	0	0	0
		Normalized (Weighted) Score:							
Financial Considerations									
Initial Cost		-	-	(0.5)	0.5	-	-	-	-
Life Cycle Cost (NPV)		0.5	(0.5)	(0.5)	0.5	-	-	-	-
Total Financial		0.5	(0.5)	(1.0)	1.0	-	-	-	-
Non-Monetary Considerations									
Input Decision Criteria 1		-	0.2	-	0.2	-	-	-	-
Input Decision Criteria 2		-	-	-	0.2	-	-	-	-
Input Decision Criteria 3		0.2	-	(0.2)	0.2	-	-	-	-
Input Decision Criteria 4		-	0.2	(0.2)	-	-	-	-	-
Input Decision Criteria 5		-	-	-	0.2	-	-	-	-
Input Decision Criteria 6		-	-	-	0.2	-	-	-	-
Total Non-Monetary		0.2	0.3	(0.3)	0.8	-	-	-	-

Raw Score:



Normalized (Weighted) Score:



4.5 Appendix E: Acronyms and Definitions

CoF - Construction of Facilities

LEED - Leadership in Energy and Environmental Design

NASA - National Aeronautics and Space Administration

NEPA - National Environmental Protection Act

NPR - NASA Policy Requirement

NPR 8820.2F - Facility Project Requirements

NPR 7120.5D - NASA Program and Project Management Requirements

NPD - NASA Policy Directive

NPV - Net Present Value

O+M - Operations and Maintenance Costs

OMB - Office of Management and Budget

OMB Circular A-11 - Preparation, Submission and Execution of the Budget

OMB A-94 - Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs

USACE - United States Army Corps of Engineers