Briefing Document

Cost and Benefit Estimates for Green Infrastructure

Executive Summary

This briefing summarizes how to estimate **costs and benefits** for sitework and landscape projects, with a focus on **Green Infrastructure (GI)**. The approach is intentionally **life-cycle based**, meaning it accounts for:

- **Capital (construction) costs**
- **Operation & Maintenance (O&M) costs**
- **Design life**
- Long-term financial metrics such as **Net Present Value (NPV)** and **Life Cycle Cost (LCC)**

Two core tools support cost estimation and GI justification:

1. **Gordian 2024 Site Work & Landscape Costs Book (RSMeans data)**
    - Best for **detailed unit-cost, line-item estimating** (materials, labor, assemblies)
2. **CNT Green Values® Stormwater Management Calculator**
    - Best for **lump-sum scenario costing** and, importantly, for quantifying **economic + environmental benefits** of GI (owner and community value)

The Green Values® Calculator is particularly useful because it produces a **holistic business case** for GI by pairing cost estimates with monetized benefits such as energy savings, pollution reduction, enhanced property value, reduced water treatment needs, and groundwater replenishment.

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1) Framework for Cost and Benefit Analysis

A financially complete evaluation considers the entire project lifecycle.

1.1 Core Cost Categories

Capital Cost (Initial Construction Investment)

Two common estimation approaches:

- **Unit Cost Method**
  - Detailed line-item pricing (labor, materials, equipment)
  - Often sourced from databases such as **RSMeans**
- **Lump Sum Method**
  - Aggregated system-level or practice-level costs
  - Often generated through scenario tools such as **Green Values®**

Operation and Maintenance (O&M) Cost

Recurring costs required to keep the system functional (inspection, cleaning, vegetation management, sediment removal, repairs).

Design Life

Expected operational life, commonly evaluated at:

- 10 years
- 50 years
- 100 years

1.2 Long-Term Value Metrics

Net Present Value (NPV)

A method to compare present value of future cash flows by accounting for the time value of money.

Life Cycle Cost (LCC)

Total cost of ownership over the full lifespan, typically including:

- initial capital cost
- O&M over time
- replacement/disposal costs (if applicable)

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2) Key Estimation Tools and Methodologies

2.1 RSMeans Unit Cost Data (Gordian 2024)

The **Gordian 2024 Site Work & Landscape Costs Book** (RSMeans-based) is a foundational resource for detailed estimating across sitework and landscape construction.

Key attributes

- Publisher: Gordian
- Item number: 602824
- Price: $400.00
- Scope: cost data for exterior improvements, utilities, piping, concrete, demolition, and related work
- Contents: ~19,800 unit costs and ~4,000 assemblies
- Includes: equipment rental rates, crew data, historical and city cost indexes, location factors, and project size modifiers

Best use case

- When you need **defensible, line-item estimates** for design development, bid-level planning, or detailed budgeting.

2.2 CNT Green Values® Stormwater Management Calculator

The **Green Values® Stormwater Management Calculator** (Center for Neighborhood Technology, CNT) is designed to compare **GI vs. conventional stormwater practices** on both:

- **cost**
- **performance**
- **benefits (monetized)**

Primary purpose

- Evaluate GI strategies that meet runoff capture goals cost-effectively—from **single sites** to **community scales**

Typical users

- planners
- landscape architects
- municipal staff
- homeowners

Modeling options

- user-defined site inputs
- built-in scenario templates for rapid comparisons

Scenario Templates (Examples)

- Urban Home (small lot: 6,075 ft²)
- Apartment (medium lot: 8,400 ft²)
- Suburban (large lot: 24,000 ft²)
- Commercial (large lot: 50,000 ft²)
- Urban Park Area (6.8 acres)
- Community Garden (small lot: 6,075 ft²)

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3) Case Study Example

Rain Garden Analysis in the Green Values® Calculator

The Green Values® Calculator includes default parameters and calculation structure for GI practices. A **rain garden** example illustrates the level of detail it supports.

3.1 Cost and Lifespan Defaults

Specification	Default Value
Construction cost	$6.07 / ft²
Maintenance cost	$0.41 / ft²
Typical useful life	22.5 years

3.2 Physical and Performance Parameters

Specification	Value
Ponding depth	8 in
Amended soil depth	8 in
Amended soil porosity	0.35
Aggregate depth	2 in
Aggregate porosity	0.25

3.3 Water Volume Capture Formula

The rain garden captured volume is calculated as:

$$V_{CRG} = (SD_{RG} \cdot SP_{RG} + AD_{RG} \cdot AP_{RG} + PD_{RG} \cdot 0.667) \cdot A_{RG}$$

Where:

- V_{CRG}= volume captured by the rain garden footprint
- A_{RG}= rain garden area
- SD_{RG}= amended soil depth
- SP_{RG}= amended soil porosity
- AD_{RG}= aggregate depth
- AP_{RG}= aggregate porosity
- PD_{RG}= ponding depth
- 0.667 = two-thirds factor used to approximate sloped ponding geometry

4) Quantifying the Benefits of Green Infrastructure

A defining feature of Green Values® is benefit monetization, separated into:

- **Owner benefits** (direct private savings)
- **Community benefits** (public and neighborhood-scale value)

4.1 Owner Benefits (Direct Financial Value)

Benefit	Description	Annual Value	Unit
Reduced energy use from trees	Trees reduce building energy use	$36	per tree
Reduced energy use from green roof	Energy savings from green roof	$18	per 100 ft²

4.2 Community Benefits (Broader Economic + Environmental Value)

Benefit	Description	Annual Value	Unit
Reduced air pollutants from trees	Trees absorb/redirect pollutants	$0.18	per tree
CO_2 sequestration from trees	Trees remove CO_2	$0.12	per tree
Compensatory value of trees	Property/neighborhood value increase	$275	per tree
Water treatment cost reduction	Avoided treatment for infiltrated/retained water	$29.94	per acre-foot
Groundwater replenishment value	Value of recharge and reduced runoff	$86.42	per acre-foot

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Practical Summary

When estimating GI costs and benefits, a defensible workflow is:

1. Use **RSMeans/Gordian** for **detailed unit-cost estimates** (engineering-level budgeting)
2. Use **Green Values®** for **scenario comparisons** and benefit monetization (planning-level justification)
3. Evaluate alternatives using **life-cycle metrics** (NPV/LCC), not just upfront construction cost
4. Present GI value in two columns: **owner value + community value** to reflect full benefits