Economic Considerations in Water Quality Standards

Virtual WQS Academy
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Office of Science and Technology
Office of Water
U.S. Environmental Protection Agency

Disclaimer

This Presentation does not:

- Impose any binding requirements
- Determine the obligation of the regulated community
- Change or substitute for any statutory provision or regulation requirement
- Represent, change or substitute for any Agency policy or guidance
- Control in any case of conflict between this discussion and statute, regulation, policy, or guidance

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Case Example

- A rural community of 700 people has a lagoon wastewater treatment system whose effluent concentration of ammonia has been exceeding its NPDES permit limits.
    - Limits are 2-5 mg/L depending on month, but monitoring data shows effluent concentrations up to 26 mg/L.
- The community's median household income is $40,000, less than half of the median household income in its state ($87,000).
- The community's unemployment rate is 10%, nearly 2x the national average.
- Replacing the lagoon with a mechanical wastewater treatment plant that would meet permit limits would increase household sewer bills by over 700%.
- The state is helping the community to research alternative pollutant control options that could make progress in removing ammonia, as well as grants and low-interest loans that could offset some of the cost of these options.

Objectives

- **Where**: Learn where economic impacts can be considered in the water quality standards program.
- **When**: Understand under what circumstances there may be flexibility in meeting water quality standards based on economics.
- **How**: Review how potential economic impacts can be assessed.

Guidance

- EPA Economic Guidance Documents:

  Interim Economic Guidance for Water Quality Standards Workbook (1995)
  Clean Water Act Financial Capability Assessment Guidance (March 2024)
  Guidelines for Preparing Economic Analyses (2024)

- Suggests approaches that may be used to meet regulatory requirements and provides useful technical support resources.
- Provides flexibility to accommodate individual circumstances.
- Other economically appropriate methods may also be used.

Legal Authority

Sec. 101 of the Clean Water Act

(a) The objective of this Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.

(1) …

(2) it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983.

Interpretation

- Water quality should get progressively better.
- May not be able to achieve everywhere immediately.
- Feasibility can be considered.

Where Economics Can Be Considered

Designated Uses – desired condition/function of a water body in society.

WQS Variances - time-limited interim designated uses and criteria.

Antidegradation requirements – protects high water quality.

Lowering or Removing Designated Uses

131.10 Designation of Uses

(g) States may … remove a use that is not an existing use, if the State conducts a use attainability analysis as specified in paragraph (j) of this section that demonstrates attaining the use is not feasible because of one of the six factors in this paragraph. …

(1) …

(2) …

(3) …

(4) …

(5) …

(6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

Water Quality Standards Variances

131.14 Water quality standards variances

(b) Requirements for Submission to EPA:

(2) The supporting documentation must include:

(i) Documentation demonstrating the need for a WQS variance.

(A) For a WQS variance to a use specified in section 101(a)(2)…

(1) One of the factors listed in § 131.10(g) is met…

(B) For a WQS variance to a non-101(a)(2) use… consideration of the use and value of the water…

Allowing Lower Water Quality Under Antidegradation Requirements

Antidegradation requirements include economics when making the demonstration that it is important to lower quality in a specific high-quality water.

131.12 Antidegradation policy and implementation methods.

(a)…

(1)…

(2) Where the quality of the waters exceeds levels necessary to support the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds… that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located.

Types of Impacts Considered

Important economic or social development

≈

Substantial and widespread economic and social impacts

Antidegradation

Designated Uses

WQS Variances

Types of Impacts Considered

The economic impacts considered are those that result from treatment beyond the technology-based requirements in regulation and law.

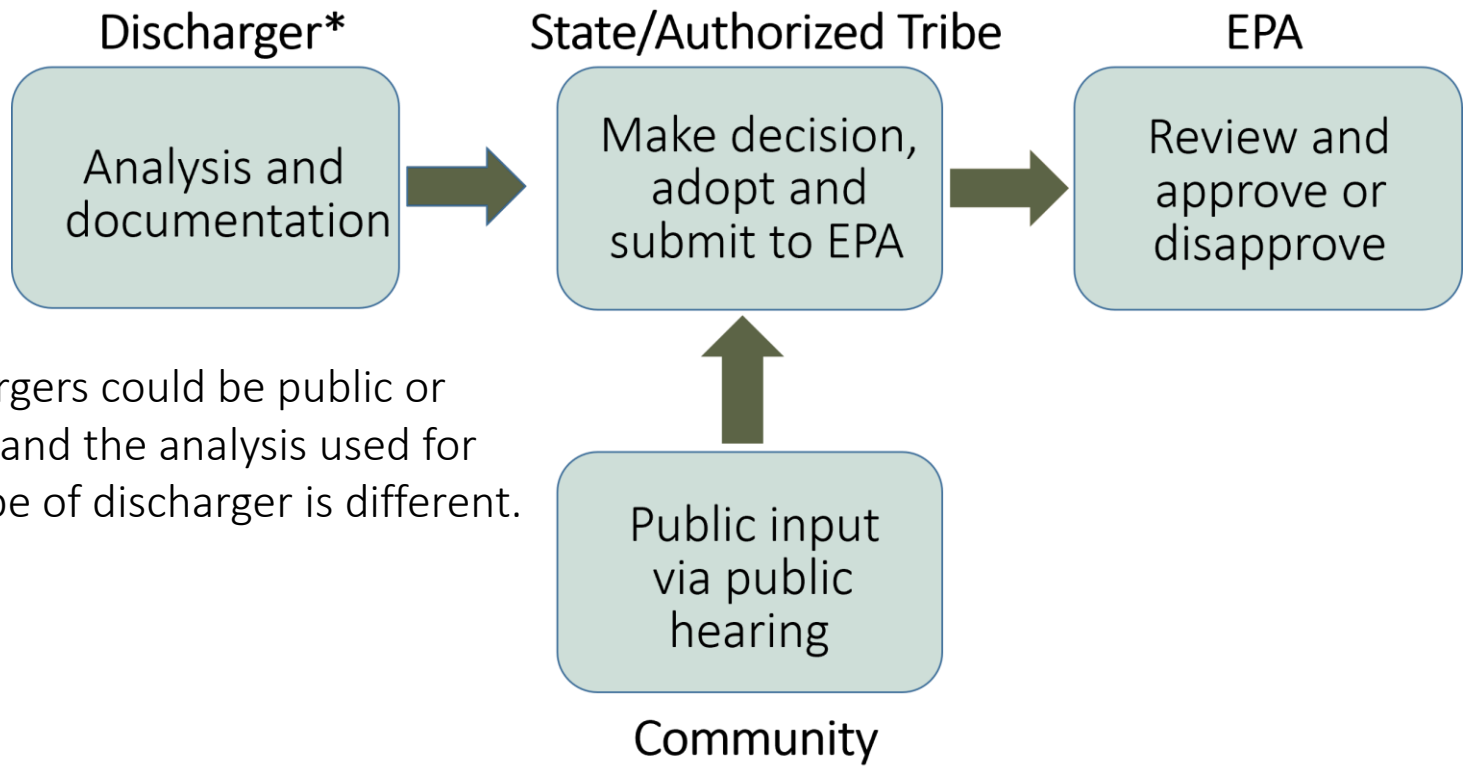
Each analysis of economic impacts demonstrates whether or not:

- The polluting entity, privately or publicly owned, will face substantial financial impacts due to the costs of the necessary pollution controls.

AND

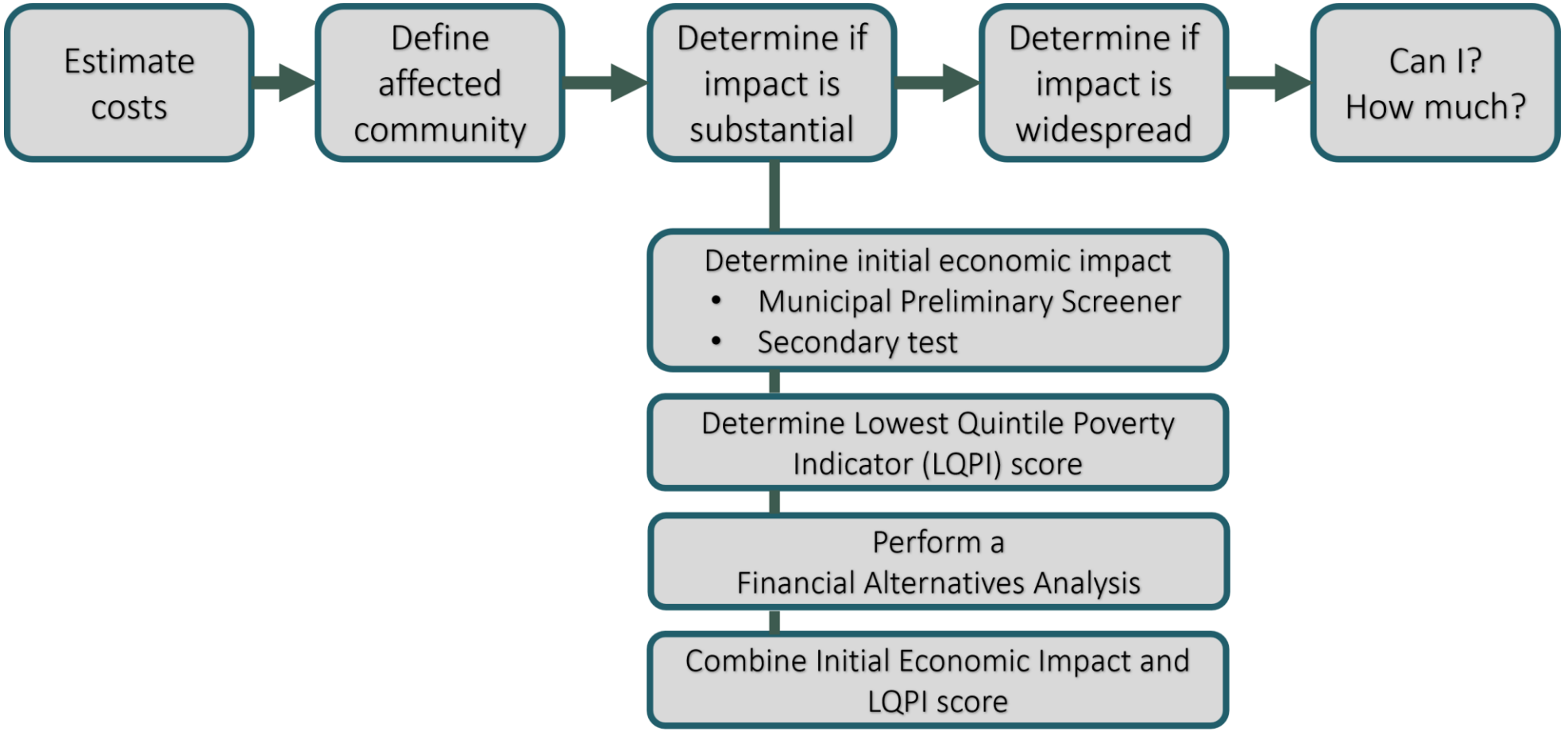
- The affected community will bear widespread adverse impacts if the entity is required to meet water quality standards.

Roles and Responsibilities

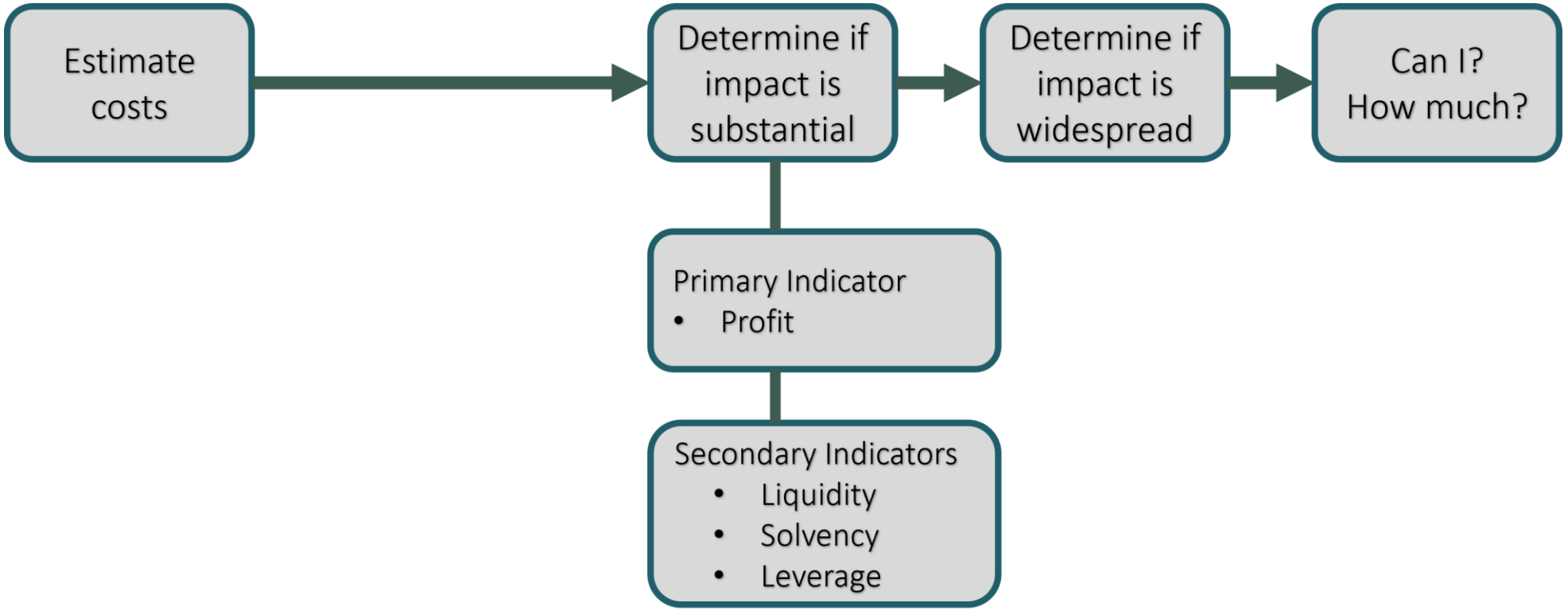


*Dischargers could be public or private, and the analysis used for each type of discharger is different.

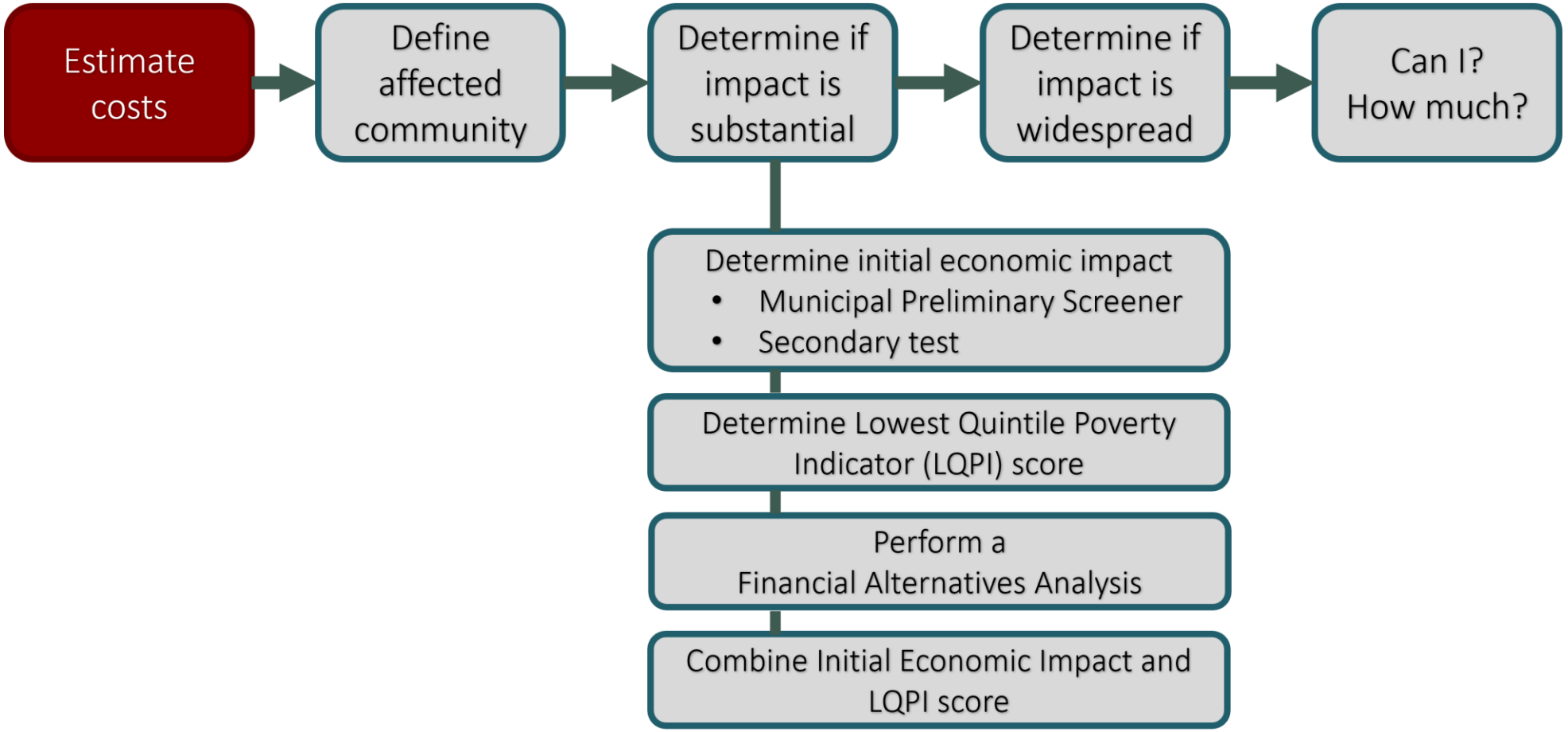
Economic Impact Analysis Steps: Public Entities



Economic Impact Analysis Steps: Private Entities



Step 1 of Public Entity Analysis



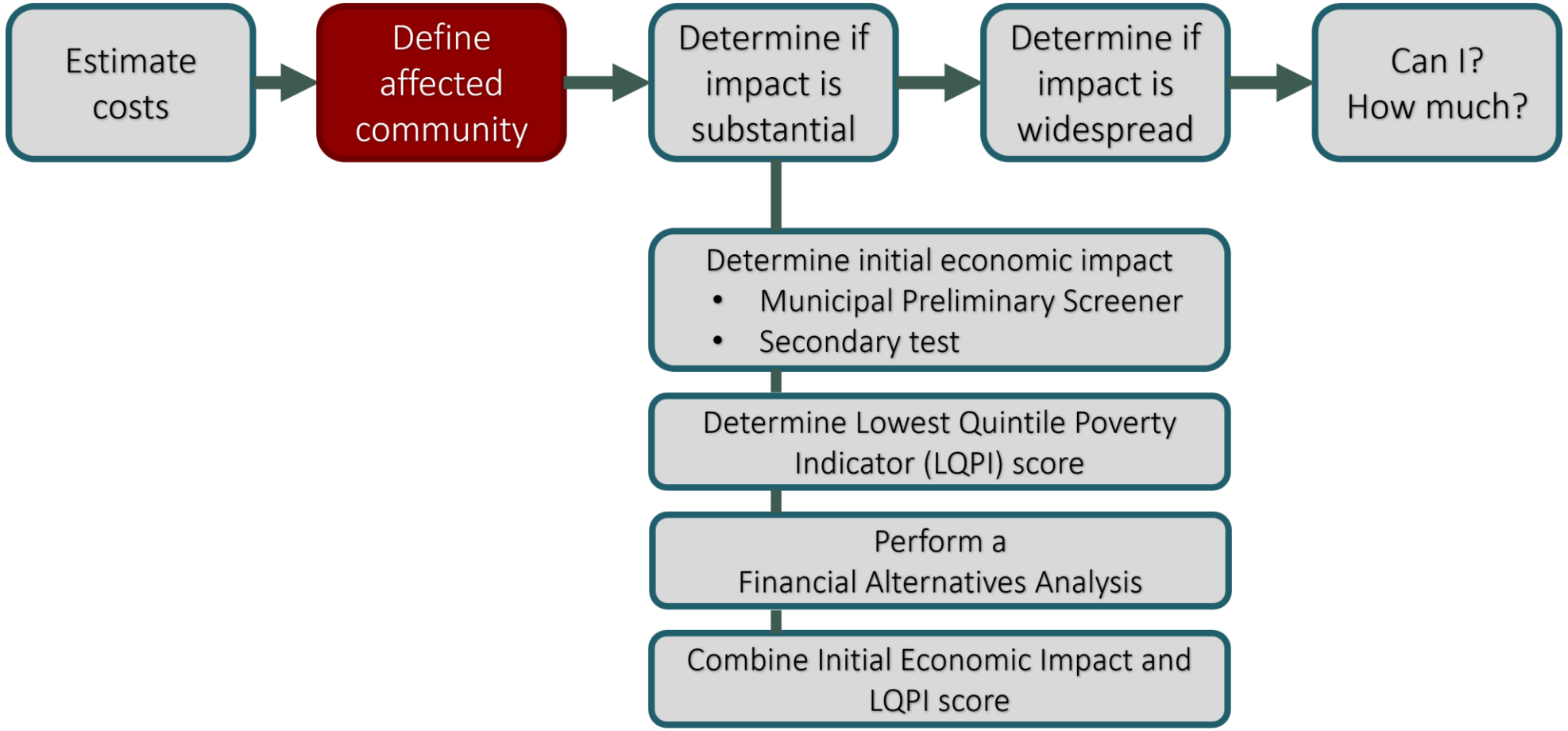
Determine Existing Pollution Control Costs

- Include total annual costs of existing pollution controls paid for by households.
- Exclude any project costs associated with meeting the WQS considered for a variance or use change.
- Estimates based on financial records and models.
- Include adequate documentation.

Determine Proposed Project Costs

- Estimates based on a credible engineering analysis.
- Include only those controls needed to meet WQS.
- Consider a broad range and combinations of cost-effective options.
- Use lowest cost method to evaluate potential impacts.
- Include adequate documentation.
- Add these proposed project costs with existing control costs to calculate total annualized control costs.

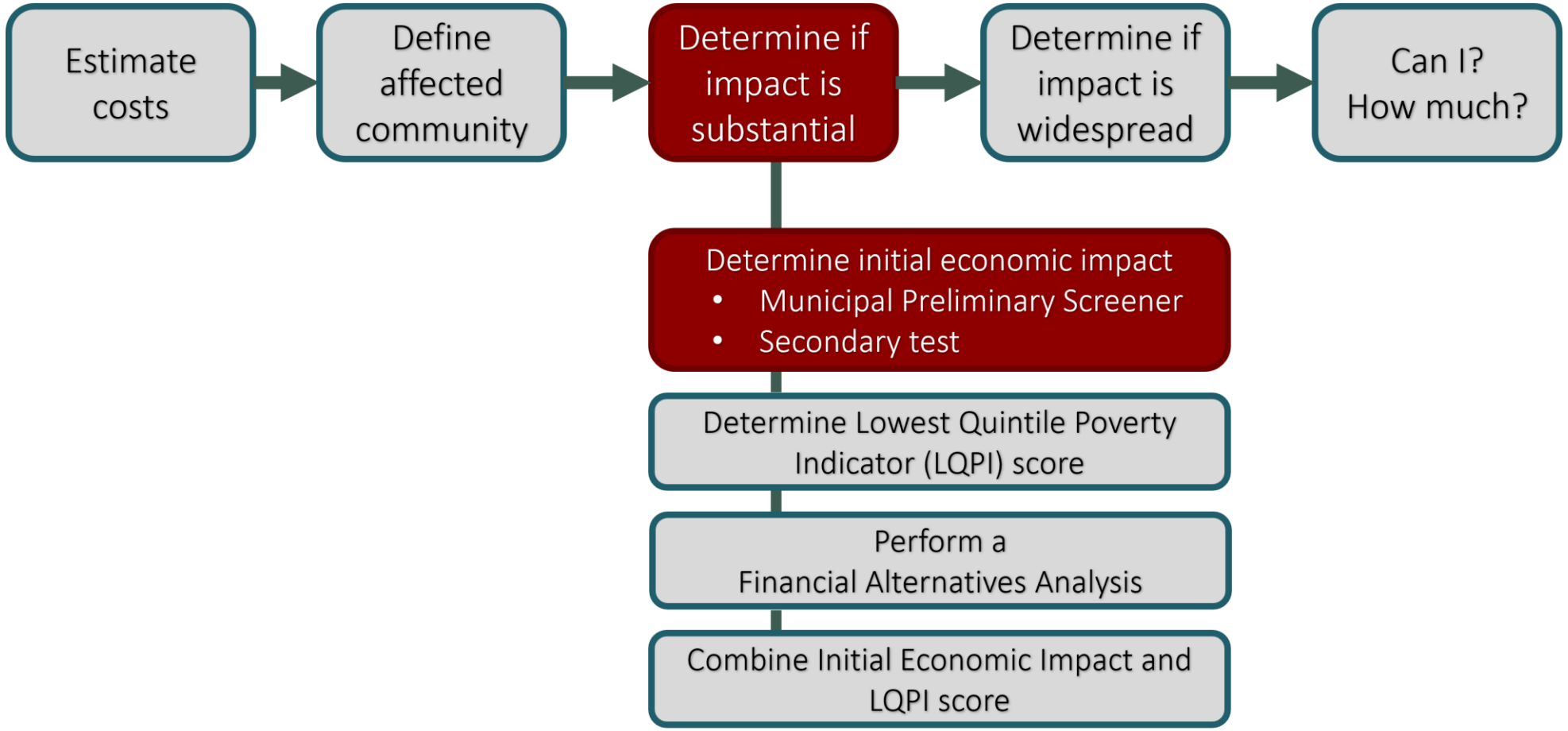
Step 2 of Public Entity Analysis



Define Affected Community

- Public entity analysis based on costs per household.
- Determine who will actually pay (usually the governmental jurisdiction paying the compliance costs).
- Consider proportion of cost burden for different users (e.g., surcharges to industrial facilities).

Step 3 of Public Entity Analysis



Municipal Preliminary Screener

$$\frac{\text{Average annualized cost per household*}}{\text{Median household income}}$$

*Includes existing related pollution control costs

Municipal Preliminary Screener	Economic Impact	Continue to Secondary Test?
<1%	Small	Not Necessary
1% to 2%	Mid-range	Maybe
>2%	Large	Yes

Secondary Test

- Two debt indicators.
- Two socioeconomic indicators.
- Two financial management indicators.
- Assign score for each indicator where:
  - Weak=1
  - Mid-range=2
  - Strong=3
- Calculate average score.

The **Secondary Score** indicators:

Bond rating

Overall net debt

Unemployment

MHI

Property tax revenues

Property tax collection rate

Secondary Test Indicators

Type	Indicator	Purpose
Debt	Bond Rating	Credit worthiness
Debt	$\frac{\text{Overall net debt}}{\text{Market value of taxable property}}$	Current debt burden on residents
Socioeconomic	Unemployment rate	General economic health
Socioeconomic	Median household income	Spending capacity
Financial management	$\frac{\text{Property tax revenue}}{\text{Market value of taxable property}}$	Capacity to support additional debt on basis of community's wealth
Financial management	Property tax collection rate	How well local government is administered

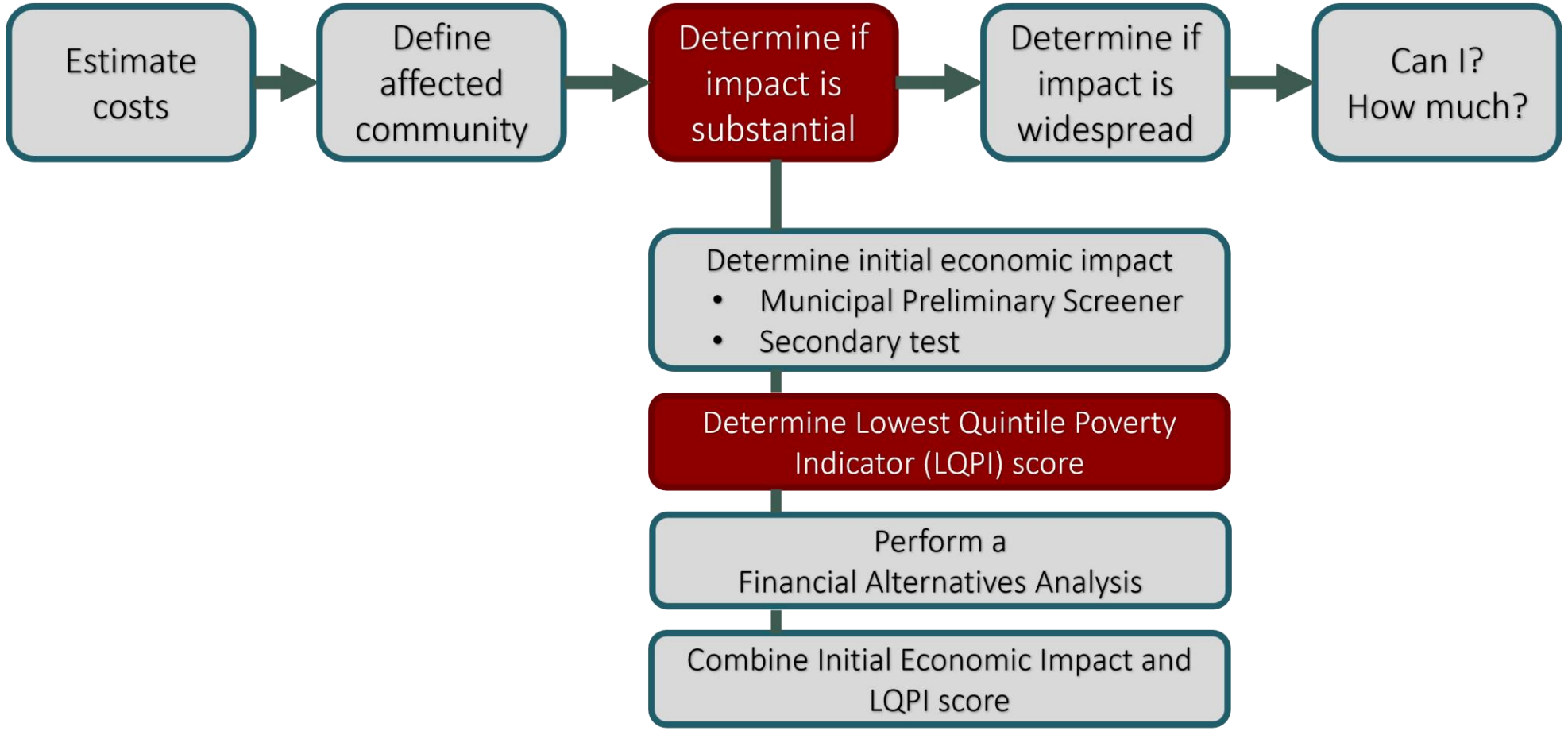
Example Calculation of Secondary Score

Indicator	Score
Bond Rating	2
$\frac{\text{Overall net debt}}{\text{Market value of taxable property}}$	3
Unemployment rate	3
Median household income	1
$\frac{\text{Property Tax Revenue}}{\text{Market value of taxable property}}$	2
Property tax collection rate	2
Average Score	2.2

Determine Initial Economic Impact

	Municipal Preliminary Screener (MPS)		
Secondary Score	Less than 1%	1% to 2%	Greater than 2%
Less than 1.5 (Weak Economy)	Impact Unclear	Substantial Impact	Substantial Impact
1.5 to 2.5 (Mid-range Economy)	Not Likely to be Substantial	Impact Unclear	Substantial Impact
Greater than 2.5 (Strong Economy)	Not Likely to be Substantial	Not Likely to be Substantial	Impact Unclear

Step 4 of Public Entity Analysis



Lowest Quintile Poverty Indicator (LQPI)

Indicator	Weight
Upper Limit of Lowest Quintile Income	50%
Percentage of Population with Income Below 200% of Federal Poverty Level	10%
Percentage of Households Receiving Food Stamps/SNAP Benefits	10%
Percentage of Vacant Housing Units	10%
Trend in Household Growth	10%
Percentage of Unemployed Population 16 and Over in Civilian Labor Force	10%

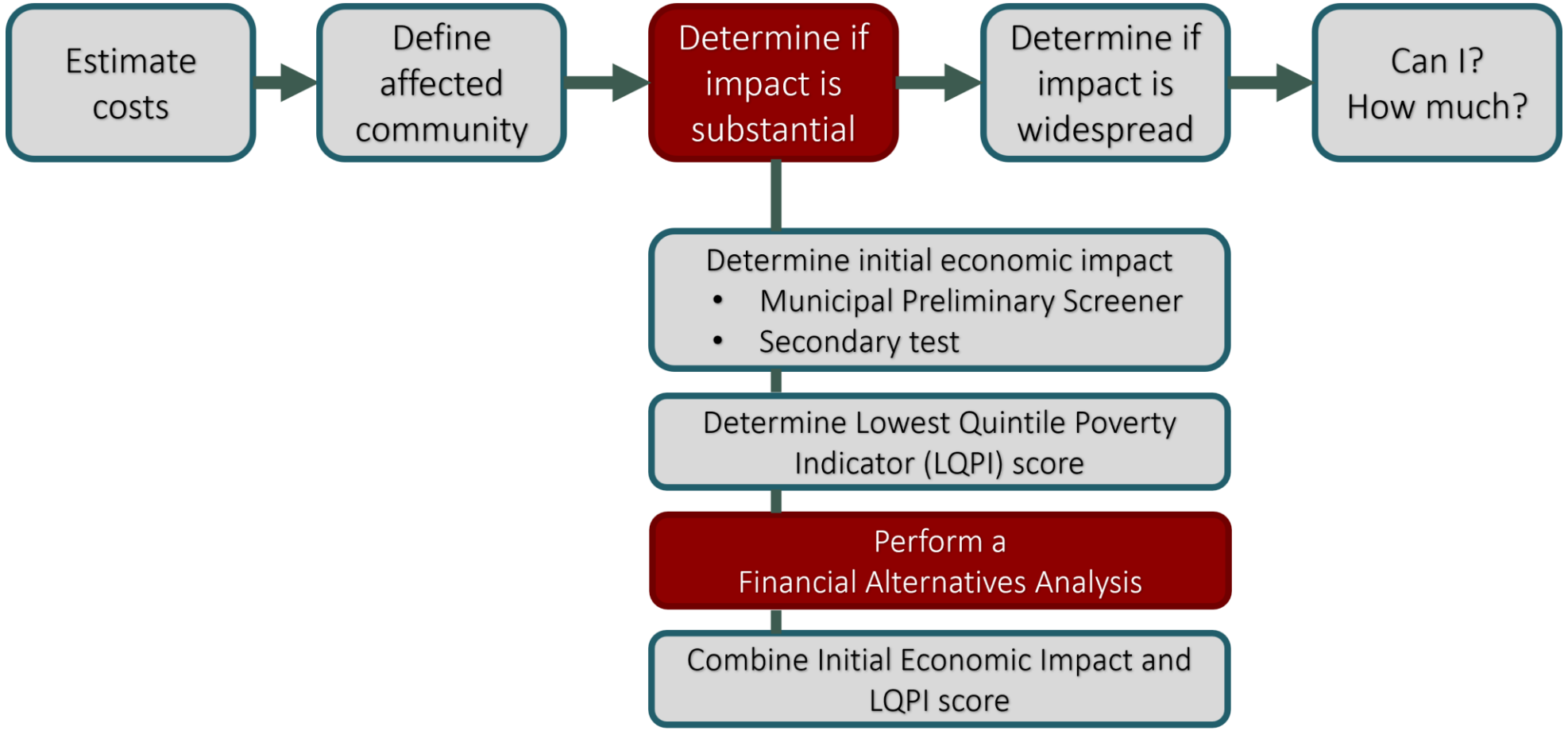
Example Calculation of LQPI Score

Indicator	Weight	Score	Average	Weighted Average
Upper Limit of Lowest Quintile Income	50%	2	2	2.1
Percentage of Population with Income Below 200% of Federal Poverty Level	10%	1	2.2	
Percentage of Households Receiving Food Stamps/SNAP Benefits	10%	3		
Percentage of Vacant Housing Units	10%	2		
Trend in Household Growth	10%	2		
Percentage of Unemployed Population 16 and Over in Civilian Labor Force	10%	3		

Evaluate LQPI Score

LQPI Score	Economic Impact
Above 2.5	Low
1.5 to 2.5	Medium
Below 1.5	High

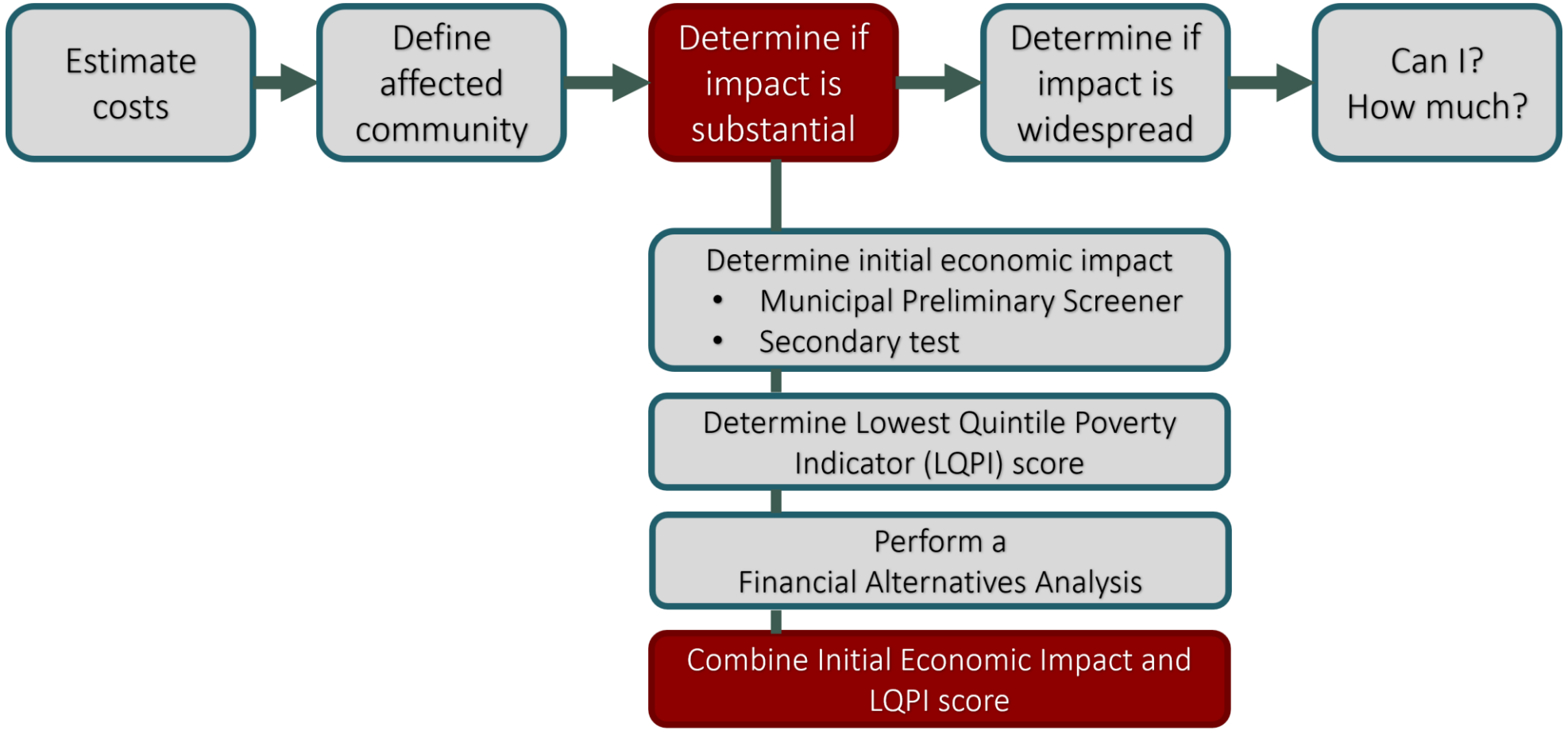
Step 5 of Public Entity Analysis



Financial Alternatives Analysis

- Grant and loan availability.
- Previous and current residential, commercial, and industrial sewer fees and rate structures.
- Other viable funding mechanisms and sources of financing.
- EPA's Guidance contains a checklist and example worksheets.
- EPA is mindful of resource constraints for small communities (population less than 3,000).

Step 6 of Public Entity Analysis



Combine Initial Economic Impact and LQPI Score Using an Expanded Economic Impact Matrix

	Lowest Quintile Poverty Indicator (LQPI) Score		
Initial Economic Impact	Low Impact	Medium Impact	High Impact
Impact Not Likely to be Substantial	Not Likely to be Substantial	Not Likely to be Substantial	Impact Unclear
Impact Unclear	Not Likely to be Substantial	Impact Unclear	Substantial Impact
Substantial Impact	Impact Unclear	Substantial Impact	Substantial Impact

Considerations When Making Water Quality Standards Decisions

- The financial alternatives analysis is important to ensure consideration of all available resources that could minimize potential economic impacts.
- EPA recommends caution when interpreting analytical results without a financial alternatives analysis.
- No financial alternatives analysis:
  - "Likely to be substantial" → "Unclear."
  - "Unclear" → "Not likely to be substantial."

Recommendations in the Context of a Financial Alternatives Analysis

	Financial Alternatives Analysis	
Expanded Economic Impact Matrix	Did Not Complete	Completed
Not Likely To Be Substantial	WQS variances: Substantial impacts not likely. Designated use revisions: Substantial impacts not likely. Antidegradation reviews: Not likely economic or social development is important.	
Unclear	WQS variances: Substantial impacts not likely. Designated use revisions: Substantial impacts not likely. Antidegradation reviews: Not likely economic or social development is important.	WQS variances: Substantial impacts likely unclear. Consider additional analyses. Designated use revisions: Consider additional analyses and actions. If substantial impacts remain unclear, consider whether a use change is appropriate at this time. Antidegradation reviews: Unclear economic or social development is important. Consider additional analyses.
Likely To Be Substantial	WQS variances: Substantial impacts unclear. Consider additional analyses. Designated use revisions: Substantial impacts unclear. Consider additional analyses and actions If substantial impacts remain unclear, consider whether a use change is appropriate at this time. Antidegradation reviews: Important economic or social development unclear. Consider additional analyses.	WQS variances: Substantial impacts likely. Designated use revisions: Consider additional analyses and actions. Antidegradation reviews: Likely economic or social development is important.

Designated Use Revisions based on 40 CFR 131.10(g)(6) ("Factor 6")

- EPA recommends caution when considering "Factor 6" for designated use revisions.
- EPA recommends exploring other factors under 40 CFR 131.10(g) that preclude attainment of the designated use.
- If pursuing a designated use revision using Factor 6, EPA recommends additional analyses and actions:
  - Trend in household growth over 10 years.
  - Evaluate up-to-date economic information (including consideration of future debt capacity) when initially considering or during triennial reviews.

Consideration of Additional Community-Specific Information

- EPA encourages states and authorized tribes to include any additional information and documentation they deem relevant to Factor 6 demonstrations.

DRINKING WATER COSTS

CUSTOMER ASSISTANCE PROGRAMS

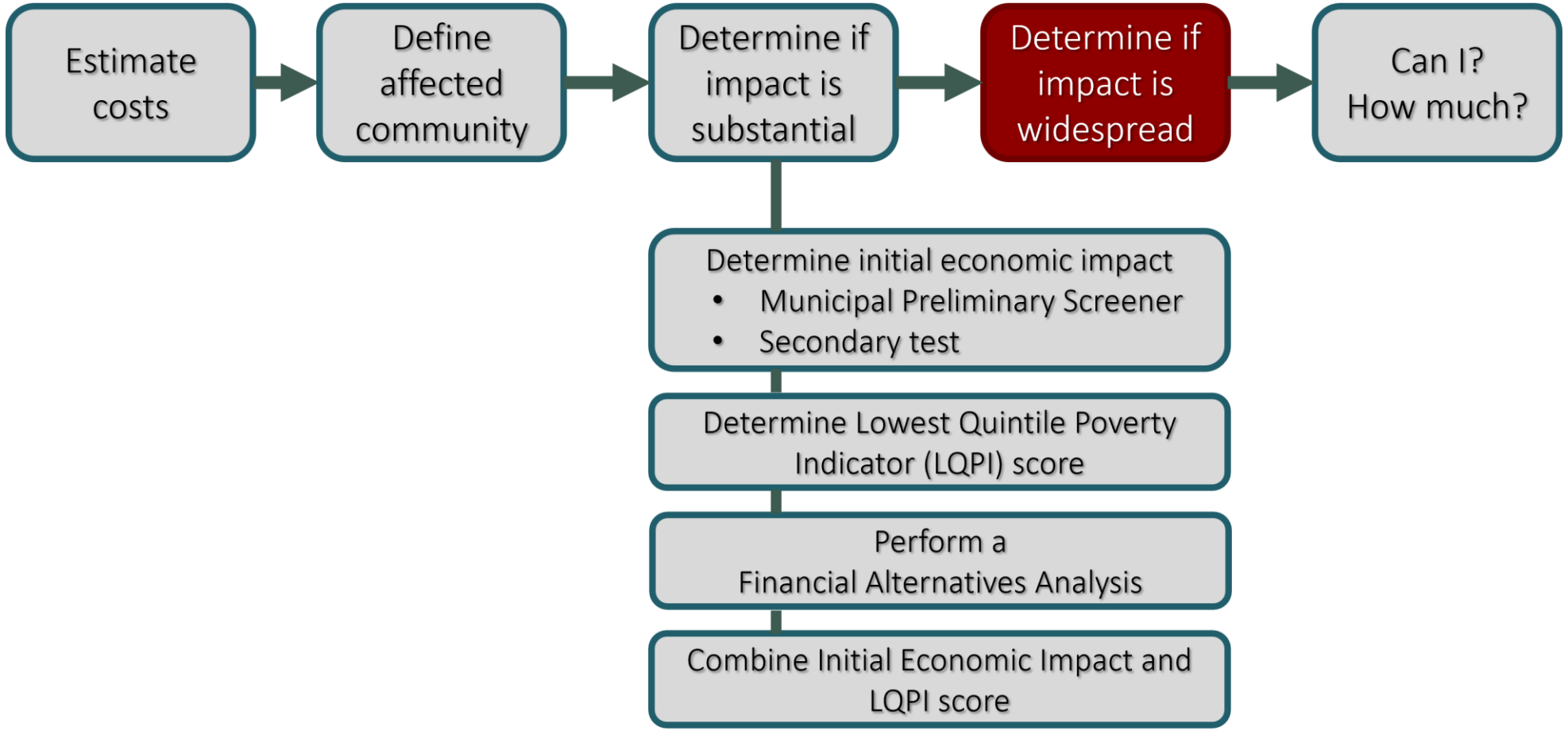
ASSET MANAGEMENT COSTS

STORMWATER MANAGEMENT COSTS

COMPARISONS TO COUNTY, STATE, AND NATIONAL DATA

UTILITY FINANCIAL AND RATE MODELS

Step 7 of Public Entity Analysis



Widespread Analysis: Impact to the Community

- Three basic steps:
  1) Define the affected community.
  2) Evaluate community's current socioeconomic characteristics.
  3) Evaluate how the community’s characteristics would change.
- Relative changes of different socioeconomic indicators.
- No single standardized test.
- Flexibility to accommodate local economic conditions.

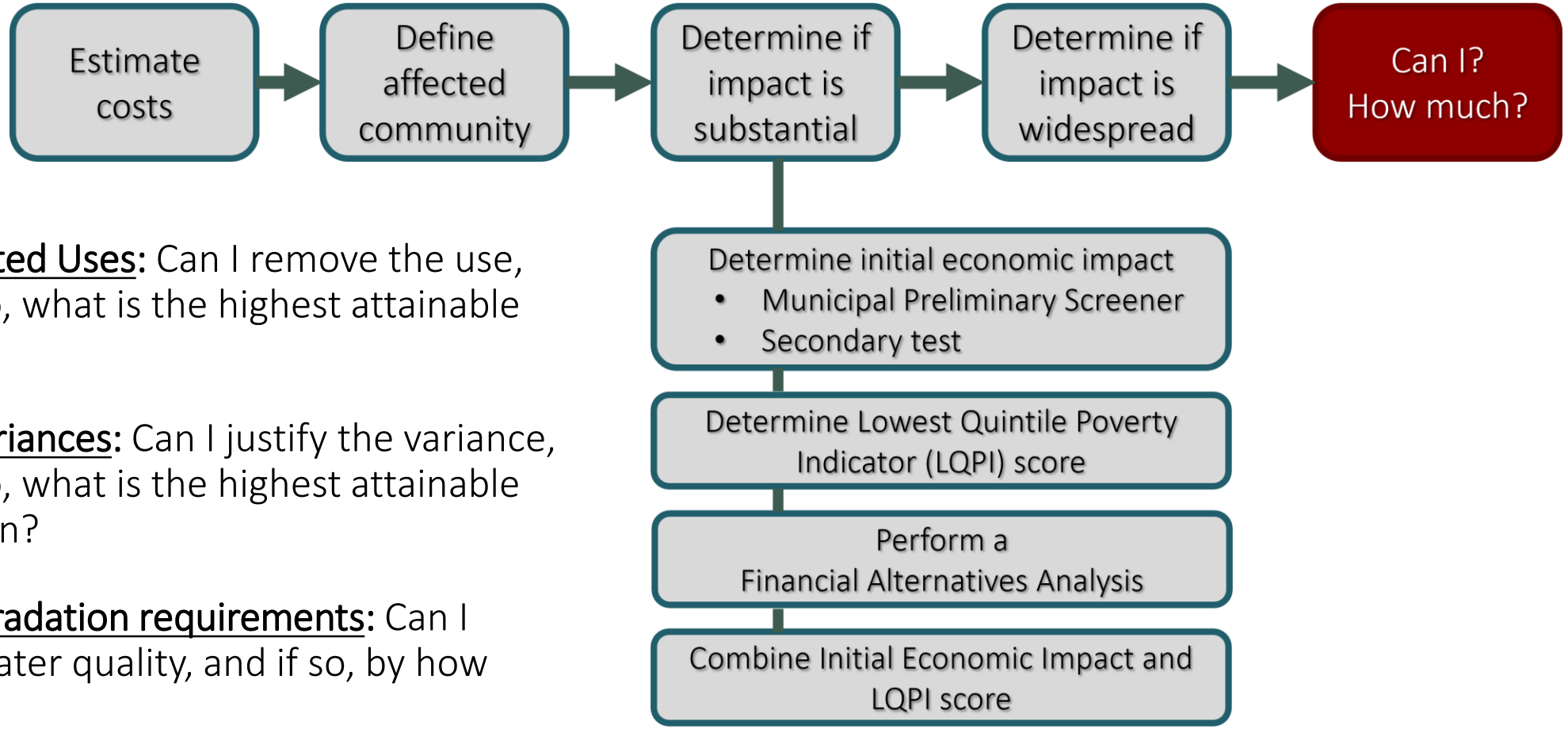
Some Widespread Impact Indicators

For public entities:

- Median household income.
- Unemployment rate.
- Local government debt.
- Households below poverty line.
- Community development potential.
- Property values.

Conclusion of Economic Impact Analysis

Public entities:

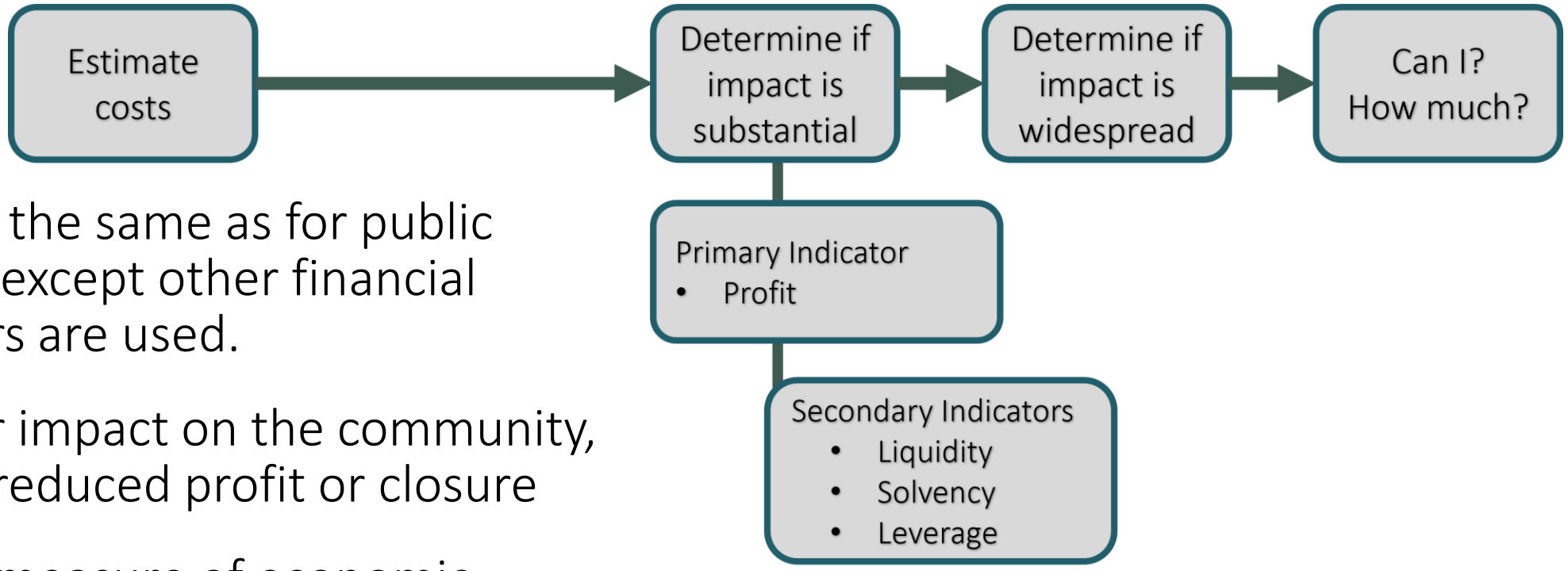


- Designated Uses: Can I remove the use, and if so, what is the highest attainable use?
- WQS Variances: Can I justify the variance, and if so, what is the highest attainable condition?
- Antidegradation requirements: Can I lower water quality, and if so, by how much?

Supporting Documentation

- Articulate how the analytical results demonstrate both substantial and widespread impacts:
  - What is minimally needed to meet the standard.
  - How much it will cost.
  - Results of Municipal Preliminary Screener, secondary test, and LQPI Score.
  - Relevant financial alternatives
  - Financial impacts on households.
  - Socioeconomic impacts on local community.
  - Sound, reasonable, defensible, and documented.
- State/EPA cooperation throughout the process is encouraged.

Private Entity Economic Impact Analysis



- Basically the same as for public entities, except other financial indicators are used.
- Consider impact on the community, not just reduced profit or closure
- Primary measure of economic impacts is profitability.
- Demonstrate the relevance of impacts for affected community.

Private Entity Financial Impact Indicators

- Primary indicator: Profit.
- Secondary indicators:
  - Liquidity – meet short-term payment obligations
  - Solvency – meet long-term obligations
  - Leverage – borrowing capacity
- Calculate with and without pollution control costs.
- Compare to each other and industry benchmarks.
- Confidentiality is not a basis to request a WQS revision without appropriate financial data.
- See EPA's 1995 Guidance for more information.

Widespread Analysis: Impact to the Community

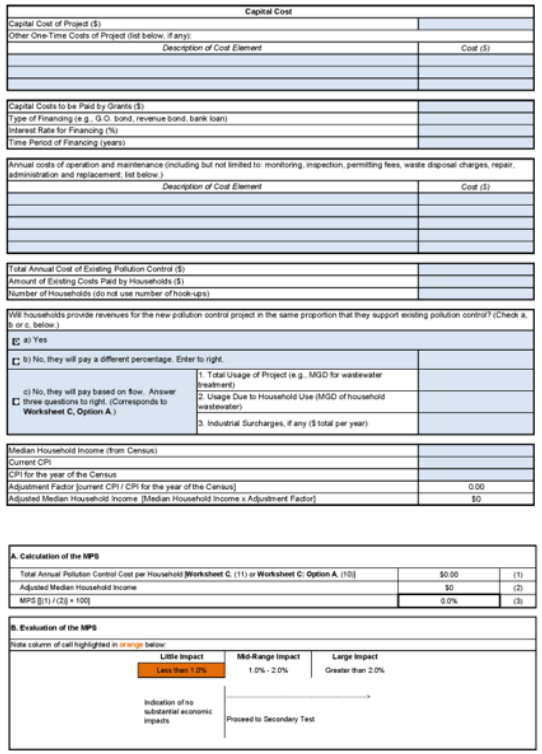
- Three basic steps:
  1) Define the affected community.
  2) Evaluate community's current socioeconomic characteristics.
  3) Evaluate how the community’s characteristics would change.
- Relative changes of different socioeconomic indicators.
- No single standardized test.
- Flexibility to accommodate local economic conditions.

Some Widespread Impact Indicators

For private entities:

- Impact of reduced profitability or facility closure on the community.
- Median household income.
- Unemployment rate.
- Households below poverty line.
- Social services expenditures.
- Tax revenues.
- Business activity.
- Other relevant indicators.

Spreadsheet Tools



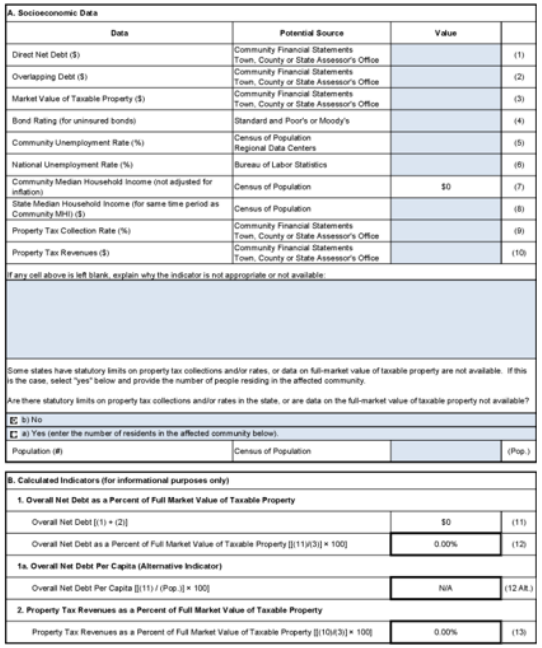
Capital Cost	
Capital Cost of Project ($)	
Other One-Time Costs of Project (list below, if any):	
Description of Cost Element	*Cost ($)*
Capital Costs to be Paid by Grants ($)	
Type of Financing (e.g., G.O. bond, revenue bond, bank loan)	
Interest Rate for Financing (%)	
Time Period of Financing (years)	
Annual costs of operation and maintenance (including but not limited to: monitoring, inspection, permitting fees, waste disposal charges, repair, administration and replacement; list below.)	
Description of Cost Element	*Cost ($)*
Total Annual Cost of Existing Pollution Control ($)	
Amount of Existing Costs Paid by Households ($)	
Number of Households (do not use number of hook-ups)	
Will households provide revenues for the new pollution control project in the same proportion that they support existing pollution control? (Check a, b or c, below.)	
☐ a) Yes	
☐ b) No, they will pay a different percentage. Enter to right.	
☐ c) No, they will pay based on flow. Answer three questions to right. (Corresponds to **Worksheet C, Option A**.)	1. Total Usage of Project (e.g., MGD for wastewater treatment)
	2. Usage Due to Household Use (MGD of household wastewater)
	3. Industrial Surcharges, if any ($ total per year)
Median Household Income (from Census)	
Current CPI	
CPI for the year of the Census	
Adjustment Factor [current CPI / CPI for the year of the Census]	0.00
Adjusted Median Household Income [Median Household Income x Adjustment Factor]	$0

A. Calculation of the MPS		
Total Annual Pollution Control Cost per Household [**Worksheet C**, (11) or **Worksheet C: Option A**, (10)]	$0.00	(1)
Adjusted Median Household Income	$0	(2)
MPS [[(1) / (2)] × 100]	0.0%	(3)

B. Evaluation of the MPS

Note column of cell highlighted in orange below.

Little Impact	Mid-Range Impact	Large Impact
Less than 1.0%	1.0% - 2.0%	Greater than 2.0%
Indication of no substantial economic impacts	Proceed to Secondary Test	



A. Socioeconomic Data

Data	Potential Source	Value	
Direct Net Debt ($)	Community Financial Statements Town, County or State Assessor's Office		(1)
Overlapping Debt ($)	Community Financial Statements Town, County or State Assessor's Office		(2)
Market Value of Taxable Property ($)	Community Financial Statements Town, County or State Assessor's Office		(3)
Bond Rating (for uninsured bonds)	Standard and Poor's or Moody's		(4)
Community Unemployment Rate (%)	Census of Population Regional Data Centers		(5)
National Unemployment Rate (%)	Bureau of Labor Statistics		(6)
Community Median Household Income (not adjusted for inflation)	Census of Population	$0	(7)
State Median Household Income (for same time period as Community MHI) ($)	Census of Population		(8)
Property Tax Collection Rate (%)	Community Financial Statements Town, County or State Assessor's Office		(9)
Property Tax Revenues ($)	Community Financial Statements Town, County or State Assessor's Office		(10)

If any cell above is left blank, explain why the indicator is not appropriate or not available:

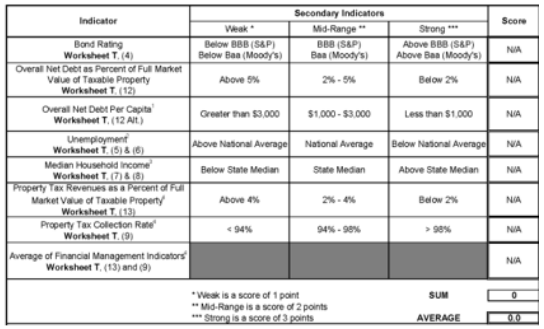
Some states have statutory limits on property tax collections and/or rates, or data on full-market value of taxable property are not available. If this is the case, select "yes" below and provide the number of people residing in the affected community.

Are there statutory limits on property tax collections and/or rates in the state, or are data on the full-market value of taxable property not available?

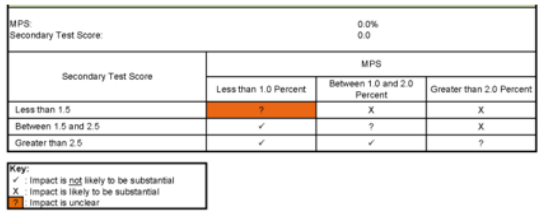
☒ b) No		
☐ a) Yes (enter the number of residents in the affected community below).		
Population (#)	Census of Population	(Pop.)

B. Calculated Indicators (for informational purposes only)

1. Overall Net Debt as a Percent of Full Market Value of Taxable Property		
Overall Net Debt [(1) + (2)]	$0	(11)
Overall Net Debt as a Percent of Full Market Value of Taxable Property [[(11)/(3)] × 100]	0.00%	(12)
1a. Overall Net Debt Per Capita (Alternative Indicator)		
Overall Net Debt Per Capita [(11) / (Pop.)] × 100]	N/A	(12 Alt.)
2. Property Tax Revenues as a Percent of Full Market Value of Taxable Property		
Property Tax Revenues as a Percent of Full Market Value of Taxable Property [[(10)/(3)] × 100]	0.00%	(13)



Indicator	Secondary Indicators			Score
	Weak *	Mid-Range **	Strong ***	
Bond Rating **Worksheet T**, (4)	Below BBB (S&P) Below Baa (Moody's)	BBB (S&P) Baa (Moody's)	Above BBB (S&P) Above Baa (Moody's)	N/A
Overall Net Debt as Percent of Full Market Value of Taxable Property **Worksheet T**, (12)	Above 5%	2% - 5%	Below 2%	N/A
Overall Net Debt Per Capita[1] **Worksheet T**, (12 Alt.)	Greater than $3,000	$1,000 - $3,000	Less than $1,000	N/A
Unemployment[2] **Worksheet T**, (5) & (6)	Above National Average	National Average	Below National Average	N/A
Median Household Income[3] **Worksheet T**, (7) & (8)	Below State Median	State Median	Above State Median	N/A
Property Tax Revenues as a Percent of Full Market Value of Taxable Property[4] **Worksheet T**, (13)	Above 4%	2% - 4%	Below 2%	N/A
Property Tax Collection Rate[5] **Worksheet T**, (9)	< 94%	94% - 98%	> 98%	N/A
Average of Financial Management Indicators[6] **Worksheet T**, (13) and (9)				N/A
			SUM	0
	* Weak is a score of 1 point ** Mid-Range is a score of 2 points *** Strong is a score of 3 points		**AVERAGE**	0.0



MPS:	0.0%
Secondary Test Score:	0.0

Secondary Test Score	MPS		
	Less than 1.0 Percent	Between 1.0 and 2.0 Percent	Greater than 2.0 Percent
Less than 1.5	?	X	X
Between 1.5 and 2.5	✓	?	X
Greater than 2.5	✓	✓	?

Key:
✓ : Impact is not likely to be substantial
X : Impact is likely to be substantial
? : Impact is unclear

- Sequential worksheets for each step.
- User enters data, and spreadsheet calculates results automatically.
- Spreadsheets for public, private, uses/variances, and antidegradation.
- https://www.epa.gov/wqs-tech/economic-guidance-water-quality-standards

Summary

- The WQS regulations allow revisions to designated uses, adoption of WQS variances, or degradation of high-quality water based on economic feasibility if a state or authorized Tribe demonstrates meeting current requirements would cause **both** substantial and widespread economic and social impacts.
- EPA provides guidance on how to assess the potential for substantial and widespread economic and social impacts.
- Guidance is intended to be helpful – it is not a requirement.

Case Example: Lagoon POTW Ammonia

- Identified two “financial alternatives” from a financial alternatives analysis to remove ammonia: a grant and a 0% interest loan.
- Identified 10 pollutant control and the projected performance (effluent ammonia mg/L) and cost of each.
- The cheapest pollutant control technology that would meet limits based on the water quality standard would result in substantial and widespread economic and social impact on the community.
- Instead, identified the pollutant control technology alternative providing the greatest pollutant reduction – while not resulting in such impacts – as the highest attainable condition of a WQS variance.
- The time required to implement the alternative and its projected performance formed the basis of the term of the WQS variance.
- EPA approved the WQS variance in 2018.

Thank you!

Will Guerry

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