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Evaluating and Developing Financial Capacity

Stormwater Funding and Financing in AZ

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ENVIRONMENTAL FINANCE CENTER AT SACRAMENTO STATE

Evaluating and Developing Financial Capacity

- **Identifying Program Objectives & Tasks**
- Estimating Costs
- Assessing Financial Capacity
- Filling in the Funding Gap
- Asset Management

Here to “help”!

Stormwater Program Objectives: An Evolution

- ***Pollution Prevention***
- ***Source Control***
- ***Treatment BMPs***

- ***Drainage***

- ***Low Impact Development***
- ***Green Infrastructure***
- ***Hydromod. Management***

A Resource for Multiple Benefits

- Improve Water Quality
- Supplement Water Supply
- Control Flooding
- Protect Environmental Systems
- Enhance Communities

Sustainable Communities

Stormwater Program Tasks

- Plan and Build Capital Projects
- Operate & Maintain Infrastructure
- Comply with Permits
- Administer the Program

Urban Stormwater Management in the United States

Capital Improvement Projects

- Planning, Design, Permitting, & Construction
- New Capital (including Build-Out)
- Infrastructure Replacement
- Updated Technology
- Green Infrastructure
- Multi-benefit projects

O&M

- Existing and Future Infrastructure
  - Inlets, conveyance, pumps, GI
- Service Types
  - Inspections, repairs, scheduling…
- Costs
  - Labor, Equipment, Materials, Reporting…

Program Management & Permit Compliance

- Planning
- Administration & Fees
- MCMs
- WQ Monitoring
- Reporting

Minimum Control Measures (MCMs)

Public Education, Outreach, and Involvement

Illicit Discharge Detection and Elimination

Construction Site Stormwater Runoff Control

Post-Construction Stormwater Management in New Development and Redevelopment

Pollution Prevention and Good Housekeeping for Municipal Operations

Industrial Stormwater Sources

Based on EPA Region 6, 2014 MS4 Conference

PM & Permit Compliance: MCM Activities

Cost Category	Typical Activities
Construction site stormwater runoff control	• Develop/update best management practices handbooks/resources • Issue grading permits • Reviewing stormwater pollution prevention plans • Issue of enforcement actions • Send winterization letters • Develop/maintain database to track inspections and enforcement actions
Illicit discharge detection and elimination	• Investigate calls reporting potential illicit discharge • Issue enforcement actions
Industrial and commercial management	• Conduct inspections • Develop/update handbooks and resources • Issue enforcement actions

PM & Permit Compliance: MCM Activities

Cost Category	Typical Activities
Pollution prevention and good housekeeping for municipal operations	• Street sweeping • Drainage system maintenance • Pump station cleaning • Public facility maintenance
Post-construction stormwater management for new and redevelopment	• Develop/update handbooks and resources • Review plans and issue permits • Issue enforcement actions • Develop/maintain database to track new infrastructure
Public education, outreach, Involvement, and participation	• Develop integrated pest management (IPM) • Public service announcements and advertisements

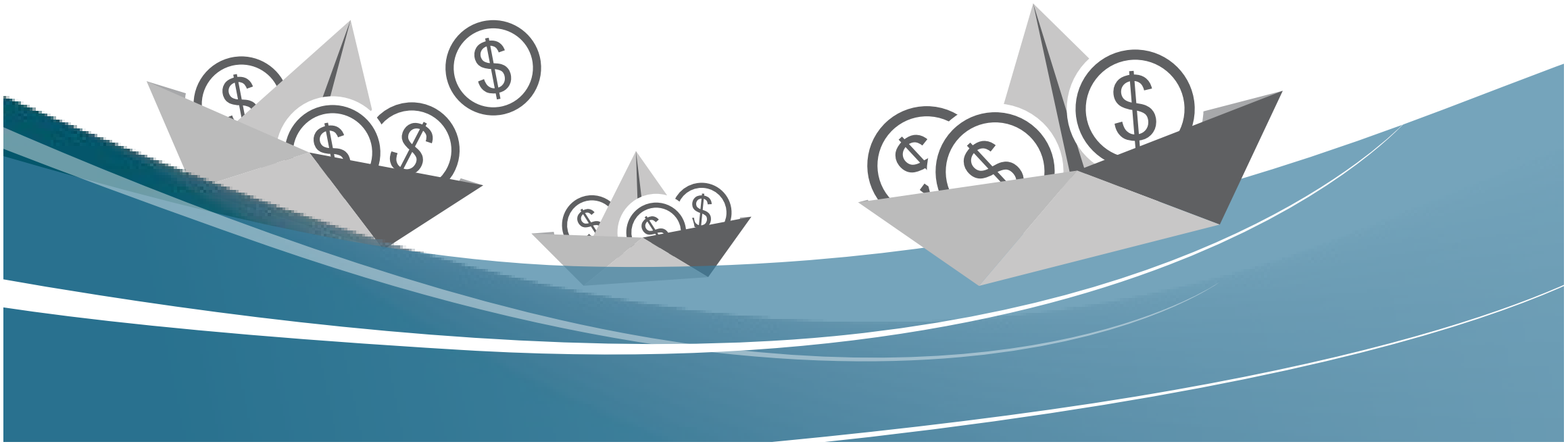
PM & Permit Compliance: MCM Activities

Cost Category	Typical Activities
Water quality monitoring	• Preparing quality assurance plans and sampling plans • Sample collection • Sample laboratory analysis • Data analysis and reporting
Overall stormwater program management	• Program effectiveness assessment • Annual reporting • Permit compliance administration • Budget planning and asset management

Identify Objectives and Tasks: Summary

Lots of stuff to do

Lots of stuff to pay for



Evaluating and Developing Financial Capacity

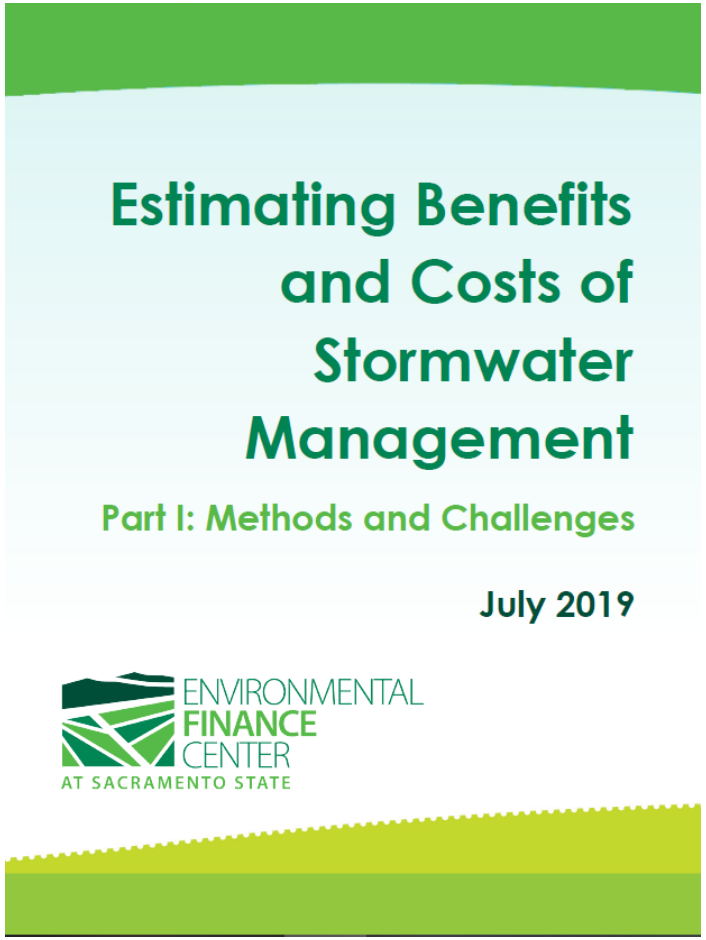
- Identifying Program Objectives and Tasks
- **Estimating Costs**
- Assessing Financial Capacity
- Filling in the Funding Gap
- Asset Management

Estimating Costs: Services & Other Considerations

- Capital Projects
- O&M
- PM
- Permit Compliance

Estimating Costs: Considerations

- Resources
- Capital Cost Assessments
- Soft Costs
- Accounting for Time
- Life Cycle Costs
- Managing Uncertainty



https://www.efc.csus.edu/reports/efc-cost-project-part-1.pdf

Estimating Costs: Resources

- Publications
  - Cost of Maintaining Green Infrastructure (ASCE 2017)
  - National SW Calculator (EPA 2014)
  - BMP Cost Estimation Algorithm (UofMN & Wiess 2007)
  - Maintenance Expenditure Study (UNH 2013)
  - Green Values National SW Management Calculator (EPA & CNT 2009)
  - Empirical Cost Evaluation of SCMs in North Carolina (NC State 2003)

Estimating Costs: Resources

- Publications
  - A Comparison of Maintenance Costs, Labor Demands, and System Performance for LID and Conventional SW Management (ASCE, 2011)
  - Engineering and Design Civil Works Cost Engineering (ACOE 2016)
  - Economic Incentives for SW Control (CRC Press, 2011)
  - CA NPDES SW Cost Survey (OWP 2005)
  - Estimating Benefits and Costs of SW Management, Part I: Methods and Challenges (EFC 2019)

Estimating Costs: Resources

- Experience/Internal Data
- Statistical Methods
  - Cost Equations or Cost Curves

Example equation for estimating construction costs of a retention basin project

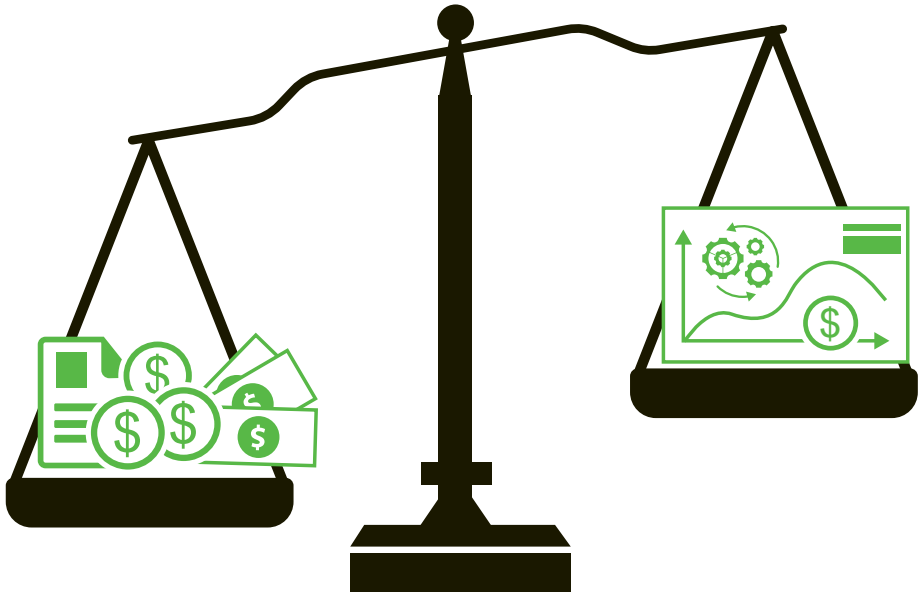
Volumetric unit costs for detention basins:

The 2003 version of the California Stormwater Quality Association (CASQA) BMP Handbook drew on previous research (Brown and Schueler 1997) to identify an equation (exponential) that related volume and construction costs for detention basins.

$$C = 12.4V^{0.760}$$

Estimating Costs: Capital Cost Assessments

- Line Item/Bottom-Up Approach
  - Wages ($/hr)
  - Materials ($/lf or $/manhole)
  - Activities ($/inspection)



Estimating Costs: Soft Costs

Percent of Capital Costs

Soft Cost	Low Cost Scenario	High Cost Scenario	Notes
Contingency	20%	30%	—
Specialized engineering	NA	15%	Applied to complex direct use only
Material cost	40%	80%	Applied to complex direct use only
Utility realignments	NA	3%	Applied to subregional and high cost curb extension projects only
Mobilization	NA	Base cost: $2,000; Additional: 10%	—
Permitting	NA	5%	—
Engineering and planning	Small scale SCMs: 10%: Non-small BMPs: 20%	35%	Small scale BMPs: simple rain garden, dry well. simple direct use BMPs

Estimating Costs: Accounting for Time

- Compare Current & Future Costs
  - Inflation Rates
  - Discount Rates (inflation, interest uncertainty)
  - Consumer Price Index
  - Present Value

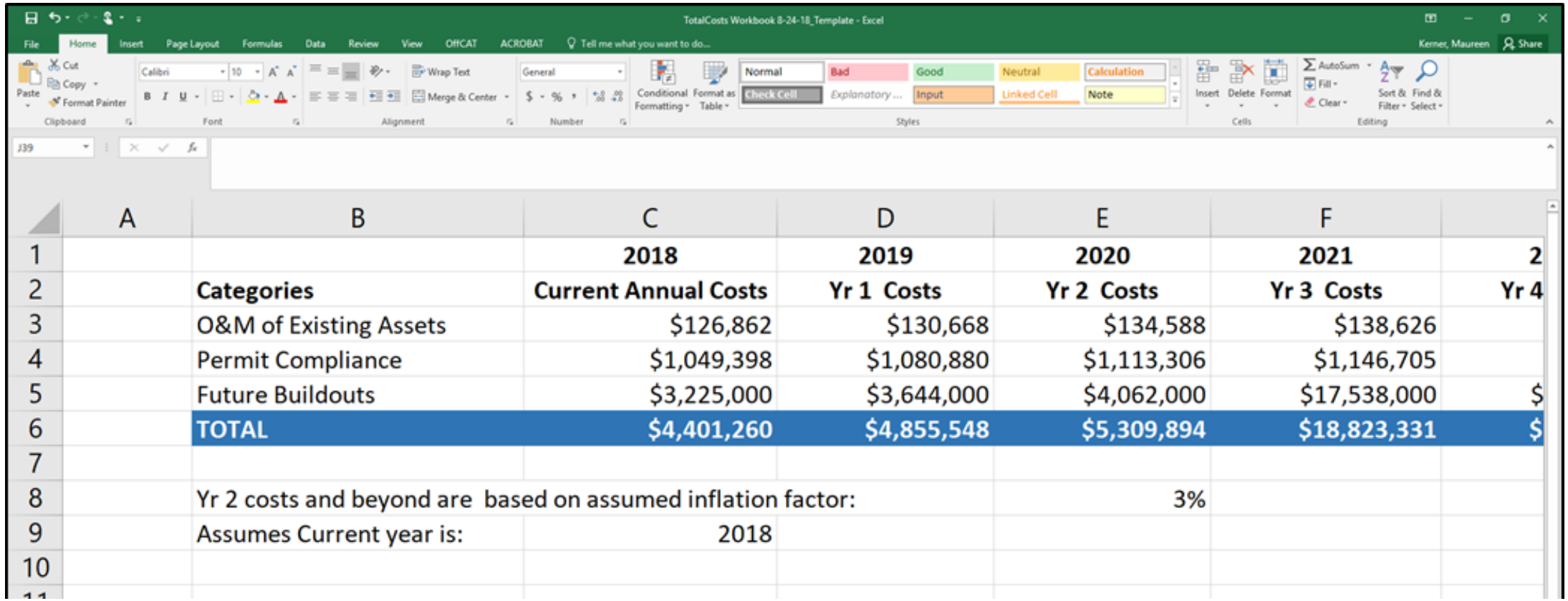
$$PV = \sum_{y=0}^{n} \left(\frac{Costs_y}{(1+r)^y} \right)$$

Estimating Costs: Life Cycle Costs

- Cost Compilation
  - Construction & O&M
  - Disposal, Energy, Debt Service, Soft Costs
  - Labor, Materials, Equipment, Fees
- Assessed over Infrastructure/Operations Lifetime
- Assume Discount/Inflation Rates

Estimating Costs: Life Cycle Costs

Tally Costs Across Years



	A	B	C	D	E	F	
1			2018	2019	2020	2021	2
2		Categories	Current Annual Costs	Yr 1 Costs	Yr 2 Costs	Yr 3 Costs	Yr 4
3		O&M of Existing Assets	$126,862	$130,668	$134,588	$138,626	
4		Permit Compliance	$1,049,398	$1,080,880	$1,113,306	$1,146,705	
5		Future Buildouts	$3,225,000	$3,644,000	$4,062,000	$17,538,000	$
6		TOTAL	$4,401,260	$4,855,548	$5,309,894	$18,823,331	$
7							
8		Yr 2 costs and beyond are based on assumed inflation factor:			3%		
9		Assumes Current year is:	2018				
10							

Estimating Costs: Life Cycle Cost Resources

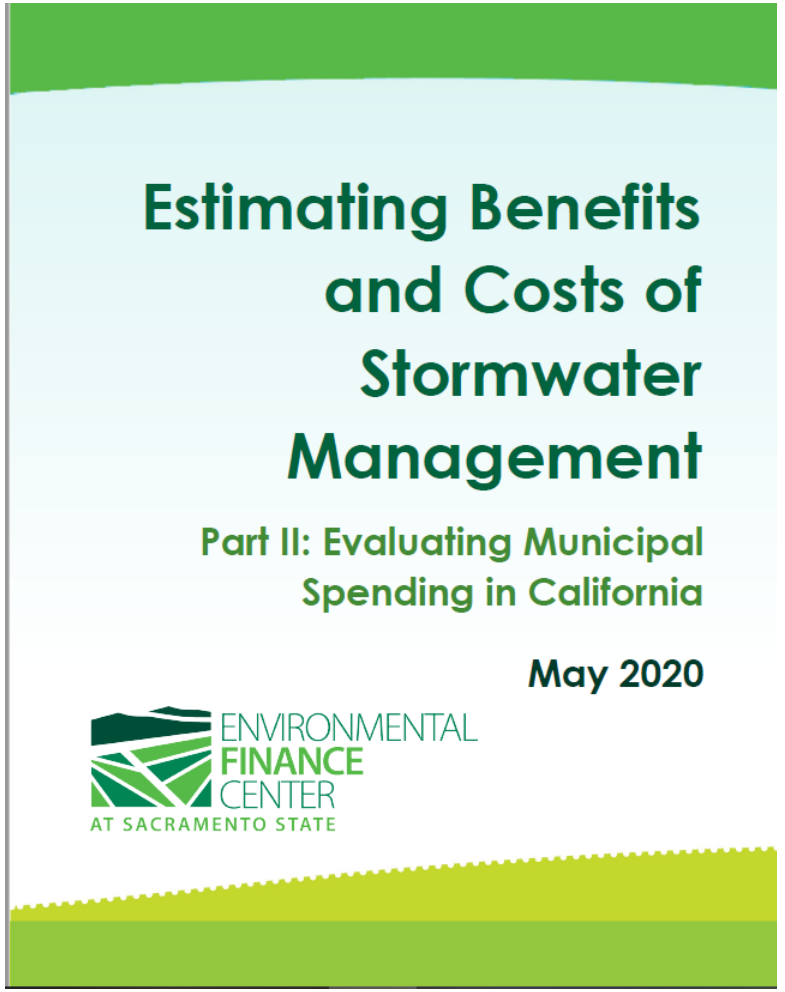
- Whole-Life Cost Tool (WERF-AWWA-UKIR 2005)
- Whole-Life Cost Models (NCHRP 2014)
- BMP-REALCOST Tool (Denver UDFCD 2018)

Estimating Costs: Managing Uncertainty

- Contingencies
- Conservative Estimates Based on Risk
- Extra Costs for High Risk or High Demand Efforts
- Cost Ranges

Estimating Costs: CA Data Assessment

https://www.efc.csus.edu/reports/efc-cost-project-part-2.pdf



Estimating Costs: CA Data Assessment

- Publicly Available Expenditures & Budgets
  - Annual audited financial reports
  - Annual MS4 reports
  - Regional watershed planning documents
- 160 entities
  - Cities, counties, FCDs, port authority, airport
- Values normalized to 2018 dollars

Estimating Costs: CA Data Assessment

Expense Category	Typical Activities
Capital costs	• Invest in new green and gray infrastructure or other structural BMPs/SCMs
Public education and involvement	• Develop programs, brochures, billboards, videos, web pages • Encourage volunteerism, public commentary, input on policy, and activism in the community • Public engagement and other public-related activities including education, outreach, involvement, and participation
Illicit discharge detection and elimination	• Investigate calls reporting potential illicit discharge • Issue enforcement actions
Construction site stormwater runoff control	• Develop and update best management practices handbooks and resources • Issue grading permits • Review stormwater pollution prevention plans • Issue enforcement actions • Send winterization letters • Develop and maintain database to track inspections and enforcement actions
Pollution prevention and good housekeeping for municipal operations	• Street sweeping • Pesticide and fertilizer management • Ditch cleaning • Used oil recycling • Secondary containment implementation with spill response kits and procedures • Facility mapping

Estimating Costs: CA Data Assessment

- Available Data:
  - Not well represented statewide

Estimating Costs: CA Data Assessment

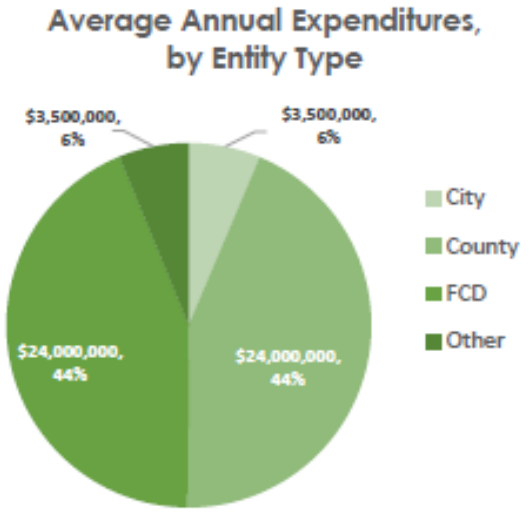
- Inconsistent data
  - Not all MS4 reported the same set of activities
- Cost description/relevance unclear
  - Additional Institutional BMPs/"Enhanced" MCMs
  - Asphalt Overlay/Sealing
  - Code Enforcement
  - Contributions
  - Consulting Services

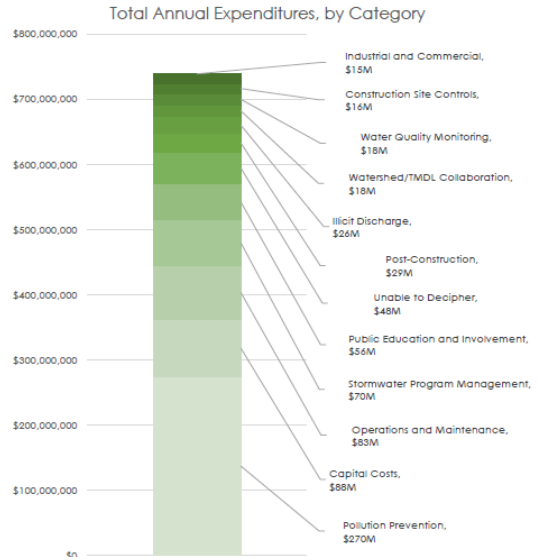
Estimating Costs: CA Data Key Findings

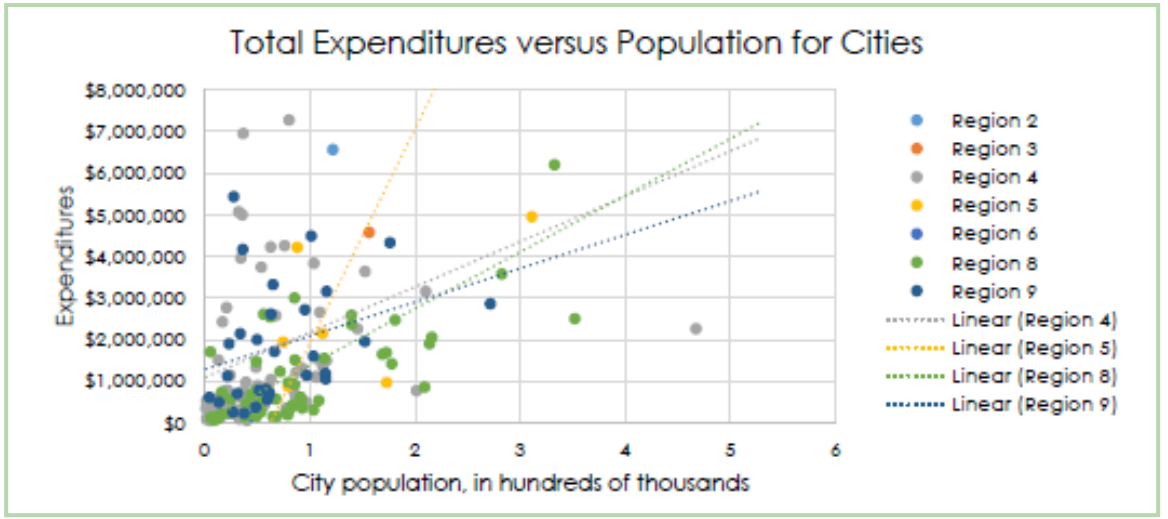
- Current SW spending is at least $700 million
- This is an underestimate due to:
  - Regional gaps in publicly-available data
  - Lack of standardized reporting (types of costs)
- Improved reporting would refine the estimate

Estimating Costs: CA Data Key Findings

- Some trends, but limited due to data gaps
  - MS4 Type
  - Geography
  - Population
  - Activity Type

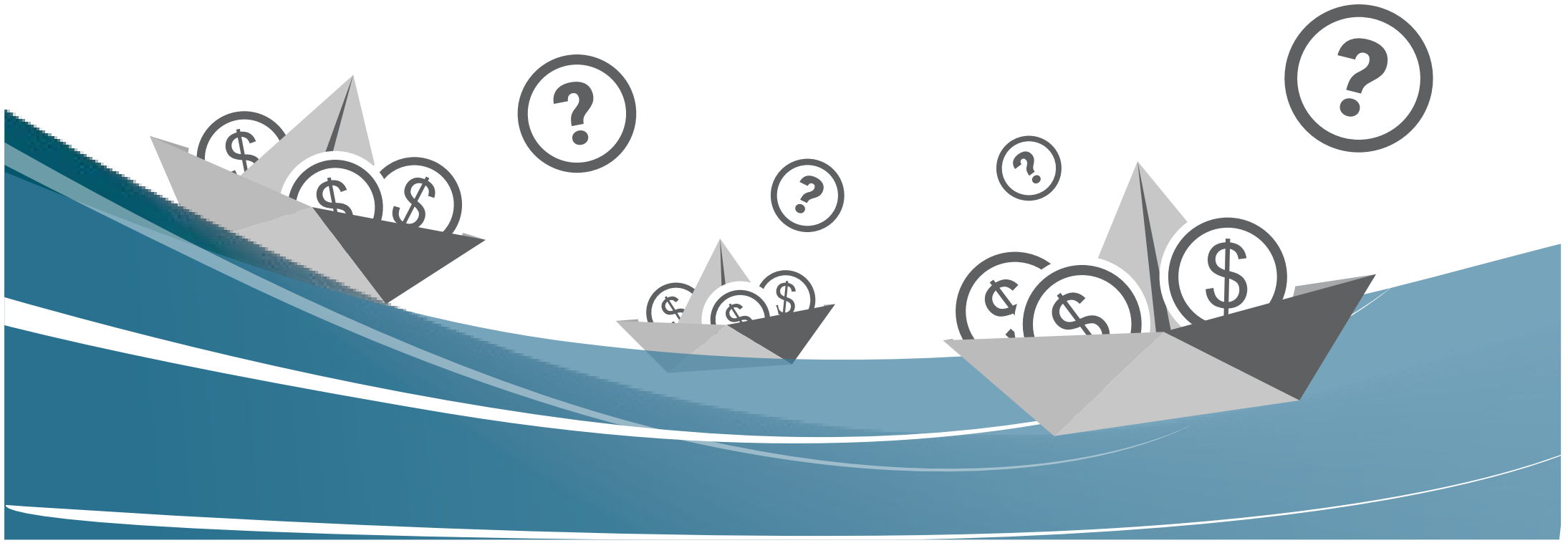






Estimating Costs: Summary

That's A LOT of Costs!
How do we pay for it all?



Evaluating and Developing Financial Capacity

- Identifying Program Objectives and Tasks
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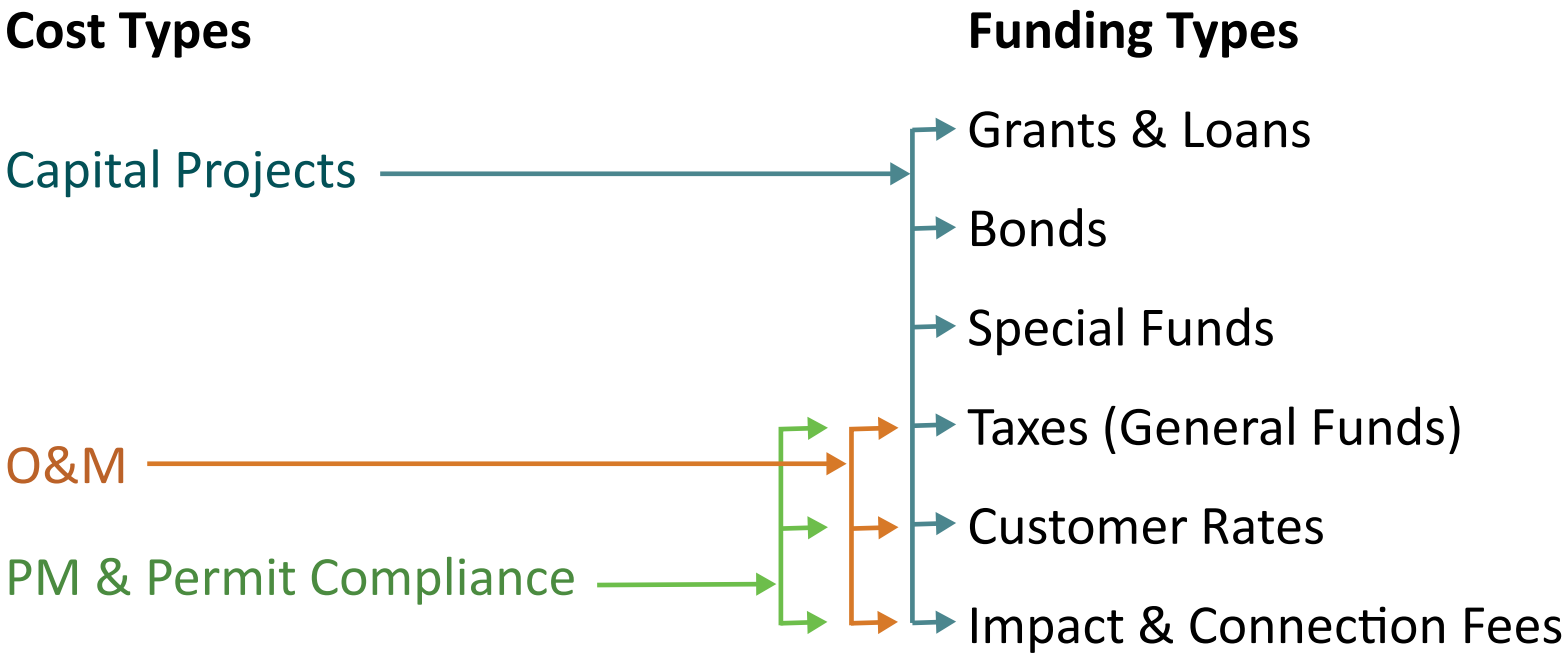
- **Assessing Financial Capacity**
- **Filling in the Funding Gap**
- Asset Management

Assessing Capacity & Filling the Funding Gap

Compare Costs & Revenue/Funding



Assessing Capacity & Filling the Funding Gap

Revenues Should Cover…

- O&M
- Some Capital
- PM & Permit Compliance
- Debt Service
- Energy Costs

If not, review additional/alternative funding sources

Assessing Capacity & Filling the Funding Gap

SW Fees: Conduct an Ability to Pay Analysis

- Estimate the total annual program costs
- Determine residential share of costs
- Calculate the cost per household (CPH)
- Calculate the residential indicator (RI)
- Identify a value or range of potential fees

Combined Sewer Overflows Guidance for Financial Capability Assessment and Schedule Development (EPA 1997 & 2012)

Assessing Capacity & Filling the Funding Gap

SW Fees: Develop a Rate Structure

- Types
  - Flat fees per parcel
  - Equivalent residential unit (ERU)
  - Intensity of development (IOD)
  - Equivalent hydraulic area (EHA)

Funding Stormwater Programs (EPA 2009)

Assessing Capacity & Filling the Funding Gap

SW Fees: Necessary Data Sets

Dataset	Description	Purpose
Asset inventory	Database of stormwater system assets and characteristics	Developing a plan for maintenance scheduling and renewal costs
Stormwater system and program costs	Unit and programmatic costs for stormwater management activities, including inspections, maintenance, and permit compliance requirements	Estimating total costs that must be covered by the incoming revenue portfolio
Property boundaries and assessor data	Geospatial layer of parcel boundaries in the utility service area, and associated tax roll data for land use, lot size, and other characteristics	Analyzing imperviousness (average or per property) used to develop a rate structure
US Census block group data	American Community Survey data for socio-demographic and economic characteristics	Assessing affordability impacts of rates through socio-economic information
Impervious surface cover	The percentage of impervious surface cover for various land use types properties	Calculating average or parcel-specific imperviousness required for several types of stormwater fees

https://www.efc.csus.edu/resources/R9EFC_AssetManagement.zip

Assessing Capacity & Filling the Funding Gap

Additional Funding Sources

- Revenue
  - Local development and realignment fees
  - State government grant programs
  - Local option sales taxes
  - Designated special district fees
- Financing
  - Bonds
  - Federal and state loan programs

https://www.efc.csus.edu/resources/R9EFC_AssetManagement.zip

Assessing Capacity & Filling the Funding Gap

Additional Funding Sources

- Inter-Agency/Department or Regional Collaboration
  - Capture & Use Infrastructure
  - Use SW to Maintain Minimum Sewer Flows
  - Install Trash Capture Devices
  - Perform Street Sweeping

Assessing Capacity & Filling the Funding Gap

Funding & Financing Resources

- EPA Water Finance Clearing House
- EFC at Sacramento State Webpage

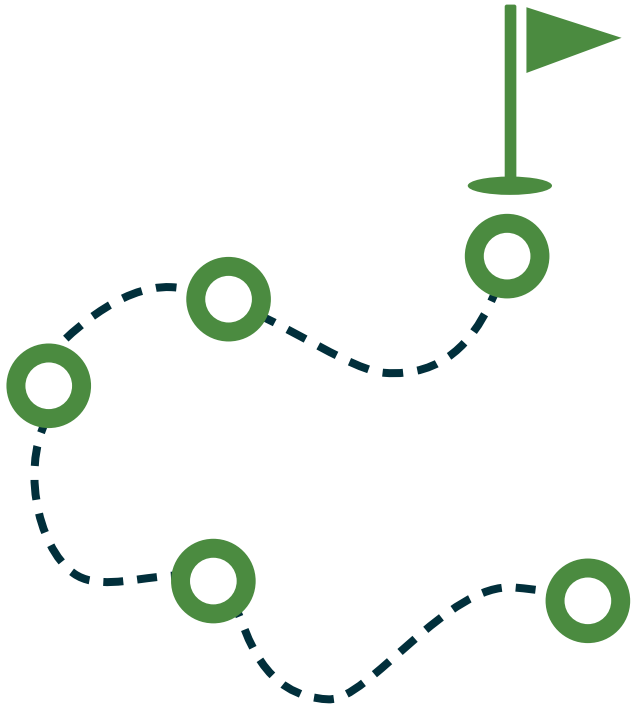
Organization	Program (key words)	Purpose or Use of Funds	How to Apply	Website	Contact
Water Infrastructure Finance Authority (WIFA)	Clean Water State Revolving Fund (stormwater management)	Funds may be used for stormwater management, nonpoint source pollution management, including watershed management, integrated water resources planning, resilience planning, forest restoration, riparian improvements, stream channel restoration, and streambank stabilization.	Add your project to the Project Priority List (PPL) by using the online application tool at: https://applicant.azwifa.gov/	www.azwifa.gov	Lindsey Jones 100 N. 7th Ave. Suite 130 Phoenix, AZ 85007 ljones@azwifa.gov 602-364-1324
	Technical Assistance (TA) Program	Program to help water systems develop, fund, and implement capital improvement projects. TA funding, up to $50,000 per project, will be incorporated into a WIFA construction loan. Assistance for (1) project design of future water and wastewater infrastructure projects or (2) to satisfy federal requirements associated with WIFA loans. Applicants must complete a Project Priorty List application. WIFA will select a TA provider. It will contract with the provider directly and stipulate the scope of work, cost and due dates.	Applications can be found here: https://azwifa.gov/programs/incentives/technical-assistance.	www.azwifa.gov https://azwifa.gov/programs/incentives/technical-assistance	
	Water Supply Development Fund (water, reuse of water, groundwater, stormwater)	Funding for projects that improve water supplies in Arizona including water rights acquistions, conveyance, storage or recovery of water, reclamation and reuse of water, replenishment of groundwater, and active or passive stormwater recharge structures that increase water supplies.	Fill out the application under "WSDF Application" on the Water Supply Development Fund homepage. When complete, email to wsdf@azwifa.gov.	www.azwifa.gov https://azwifa.gov/programs/funding-type/wsdf	
Arizona Department of Environmental Quality (ADEQ)	604(b) Water Quality Grant Program (stormwater, green infrastructure)	Provides funding to regional planning organizations for regional water quality management planning activities. 604(b) funds are for activities, such as: improving stormwater systems, determining ways to expand green infrastructure programs, determining the nature, extent and causes of point and nonpoint source water pollution problems, and developing plans to resolve these problems, other water quality management planning projects.	Download and complete the application found at https://static.azdeq.gov/wqd/604b_grant_app.pdf. Email the completed application to rowe.julia@azdeq.gov.	https://www.azdeq.gov/604b-water-quality-grant-program	Julia Rowe rowe.julia@azdeq.gov 520-628-6721

Organization	Program (key words)	Purpose or Use of Funds	How to Apply	Website	Contact
US Department of the Interior—Bureau of Reclamation	WaterSMART Program (water, water supply, water management)	Reclamation's WaterSMART Program provides financial assistance through grants and cooperative agreements to states, tribes, irrigation districts, water districts, or other organizations with water or power delivery authority. Various funding opportunities are available to assist with planning and implementing actions to conserve water, increase water supply reliability, improve water management, and avoid potential water conflicts.	A variety of funding opportunities are available through the WaterSMART Program. Explore the WaterSMART page to find the right opportunity for you.	https://www.usbr.gov/watersmart/	Phoenix Area Office Lisa Rivera lrivera@usbr.gov 623-773-6274 Yuma Area Office Nohemi Olbert nolbert@usbr.gov 928-343-8294 Lower Colorado Basin Regional Office (northwest Arizona) Ken Isakson
Federal Emergency Management Act (FEMA)	Flood Mitigation Assistance (FMA) Grant (drainage, flood control)	Competitive grant program that provides funding to states, local communities, federally recognized tribes and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program.	Applications are completed and submited through FEMA GO. More information and application resources can be found at https://www.fema.gov/grants/mitigation/applying	https://www.fema.gov/grants/mitigation/floods	John Powderly john.powderly@fema.dhs.gov
	Building Resilient Infrastructure and Communities (BRIC) Fund	Supports states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. Building Resilient Infrastructure and Communities (BRIC) funds may be used for: capability and capacity building (C&CB) activities, mitigation projects management costs.	Applications are completed and submited through FEMA GO. More information and application resources can be found at https://www.fema.gov/grants/mitigation/applying	https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities	
EPA's Water Infrastructure Finance and Innovation Act (WIFIA)	WIFIA Loan (stormwater, green infrastructure)	Federal credit program administered by EPA for eligible water infrastructure projects such as pepair, rehabilitation, or replacement of stormwater systems, green infrastructure, non point sources pollution prevention, and habitat restoration projects.	Information on applying as well as downloadable application materials can be found here: https://www.epa.gov/wifia/how-apply-wifia-assistance-1.	https://www.epa.gov/wifia	Karen Fligger Fligger.Karen@epa.gov (202)564-2992

https://www.efc.csus.edu/stormwater-funding-and-financing/

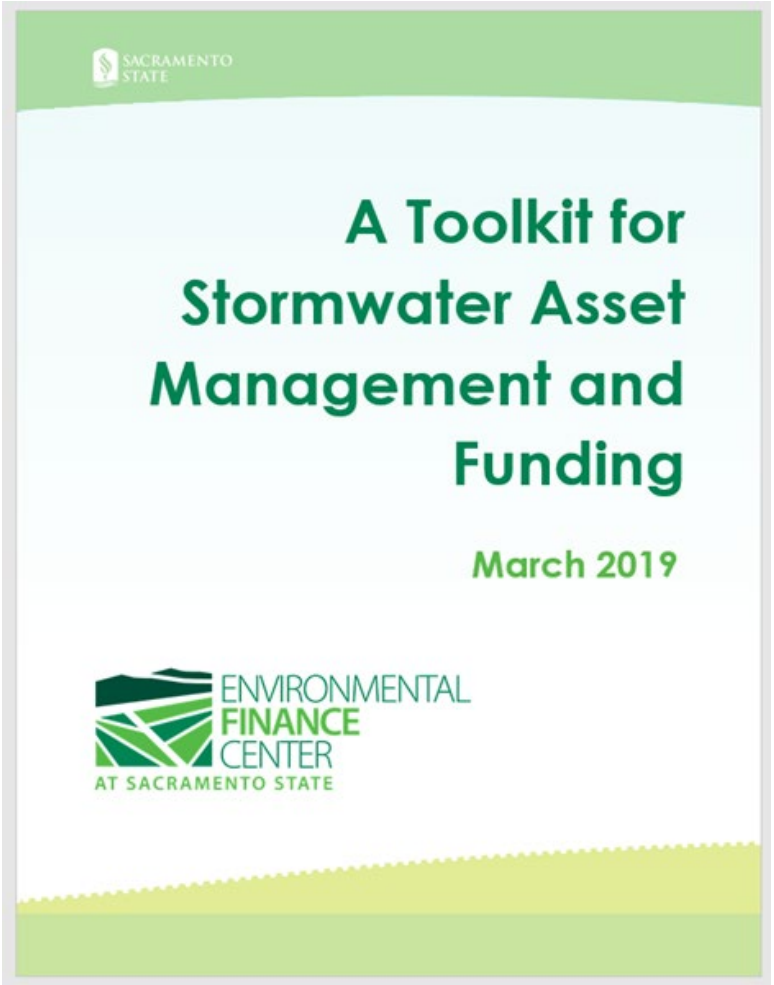
Filling in the Funding Gap

- Identifying Program Objectives and Tasks
- Estimating Costs
- Assessing Financial Capacity
- Filling in the Funding Gap
- **Asset Management**



Asset Management: A Tool for Stormwater Programs

- Track O&M
- Prioritize O&M Needs
- Plan for Replacements & New Capital
- Estimate Costs
- Identify Funding
- Communicate
  - Intent
  - Plans
  - Progress



EPA's 5 Core Asset Management Components

1. Asset Inventory
What assets do you have & what is their condition?

2. Level of Service
What are the service goals for your system?

3. Criticality
Which are the most important assets to maintain?

4. Life Cycle Costs
How much will it cost for O&M (including asset replacement)?

5. Long Term Funding
How are you going to pay for it all?

Asset Management: 5 Core Components

https://www.youtube.com/watch?v=BgfFtV9mLJ0

1. Asset Inventory: Compile Characteristics

- Asset Types
  - Grey infrastructure
  - Green infrastructure
  - Equipment
- Material
- Location
- Year of Install
- Estimated Effective Life
- Structural Condition
- Proximity to Key Community Features






1. Asset Inventory: Evaluate Risk

- Probability of Failure (POF)
  - Remaining life
  - Structural condition
- Consequence of Failure (COF)
  - General rating (negligible, moderate, high)
  - Depth & size of asset (influences cost of replacement)
  - Proximity to important community features:
    (floodplains, environmental hazards, buildings, roadways)
- Redundancy (R)
  - Duplicate asset serving as back-up

Risk = POF x COF x R

2&3. Level of Service (LOS) & Criticality: Define

- What is Level of Service?

  “a measure of the quality or expected reliability that must be provided by an agency to meet a community’s basic needs and expectations”

  -Grand Rapids, MI 2016

- What are Critical Assets?

  High risk of failure (high probability & high consequence)

2&3. Level of Service (LOS) & Criticality: Define

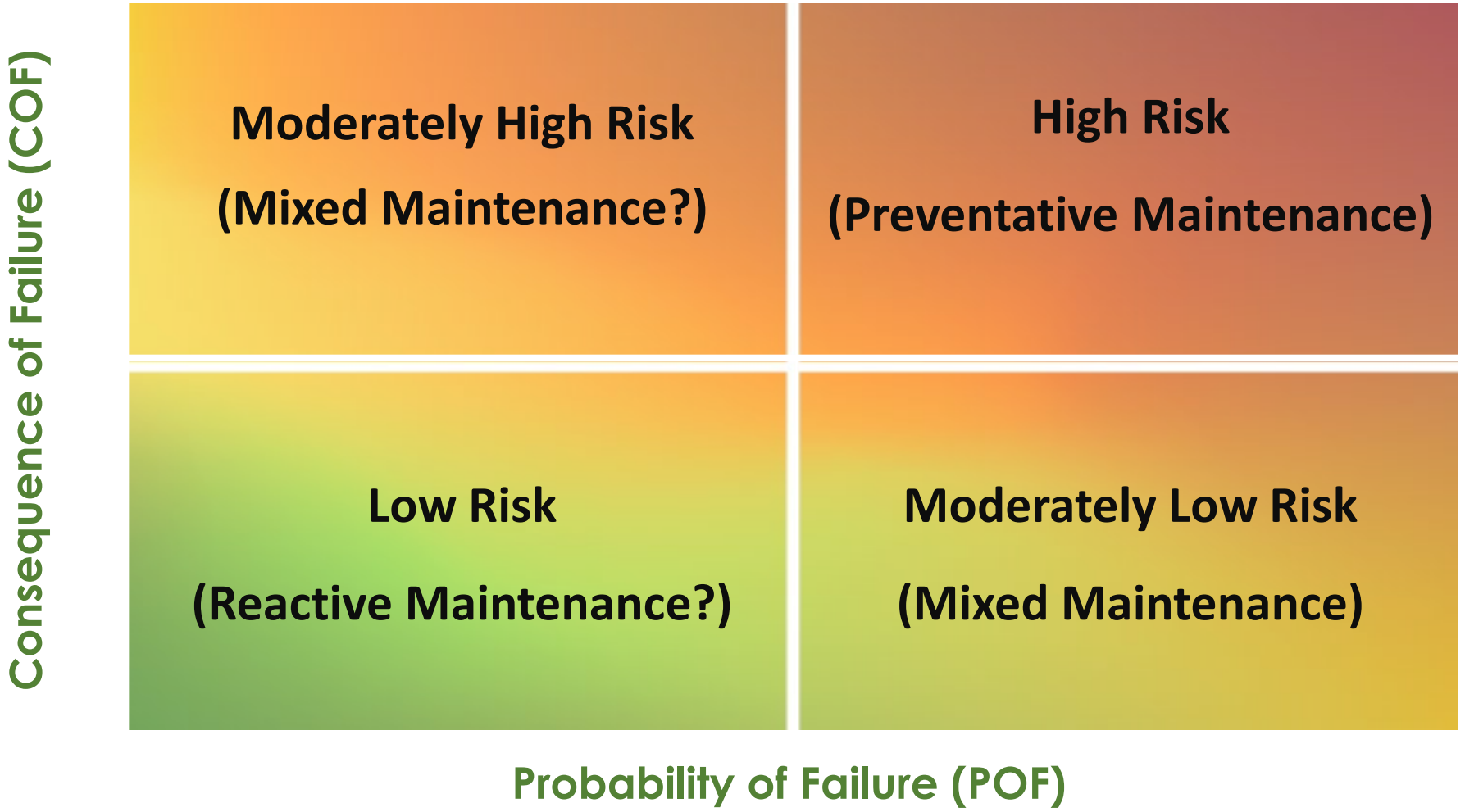
- Degrees of LOS
  - Reactive

    Meet maintenance and repair needs as they arise
  - Preventive

    Proactively undertake maintenance and renewal activities prior to failures
  - Mixed

    Assign some assets reactive maintenance, and others preventive

2&3. LOS & Criticality: Inform Maintenance



2&3. LOS & Criticality: The Process

- Identify SMART Goals
- Involve Customers & Staff
- Track Progress

Source: Georgia Association of Water Professionals

2&3. LOS & Criticality: Identify Goals

- Goal Categories
  - Energy Efficiency
  - Water Efficiency/Conservation
  - Social Considerations
  - Environmental Considerations
  - Customer Service
  - Regulatory Requirements

2&3. LOS & Criticality: Identify Goals

Internal

- Don’t impact customers
- Set by utility staff
- Examples
  - Maintenance Scheduling
  - Energy Efficiency

External

- Impact customers
- Set with customer input
- Examples
  - Response for back-ups/flooding
  - Response time for other customer complaints

2&3. LOS & Criticality: Identify Goals

Specific	Details exactly what needs to be done
Measurable	Achievement or progress can be measured
Achievable	Objective is accepted by those responsible for achieving it
Realistic	Objective is possible to attain (important for motivational effect)
Time Bound	Time period for achievement is clearly stated

2&3. LOS & Criticality: Establish Service Goals

Moderate level of service (Grand Rapids 2016)

Asset	Inspection	Corrective Maintenance	Preventive Maintenance	System Renewal
Gravity Mains	PACP[1] CCTV[2] inspect pipes greater than 75 years old over 10 years.	Replace 15% of assets that have reached end of EEL over 10 years.	Perform rehabilitation to extend EEL for 10% of inspected sewers over 10 years.	Replace every 150 years.
Force Mains	Visual inspection every 2 weeks during pump station inspection. PACP CCTV inspect every 15 years.	—	—	Replace every 100 years.
Catch Basins	Clean and inspect 25% annually (approx. 4,264). Record and monitor debris levels for cleaning	Clean 2,500 annually and perform corrective maintenance.	Replace 15% of assets that have reached end of EEL over 10 years.	Replace every 100 years.
Outfalls	Inspect all outfall points every 5 years per MS4[3] requirements.	Replace top 10% by POF each cycle.	Stabilize bank and erosion control at 5% of assets each cycle.	Replace every 150 years.
Detention Basins	Complete site inspection 3 times annually including routine maintenance.	—	—	Facility' renovation every 100 years. Includes regrading, seeding, renew inlet/outlet structures.
Culverts	CCTV/walk/inspect 50% of culverts annually.	Replace/rehabilitate top 5% by POE.	Clean 20% of all assets annually.	Replace every 150 years.

2&3. LOS & Criticality: Involve Stakeholders

- Door to door
- Annual meetings
- Focus groups
- Surveys
- Internet polls
- Social networking
- Customer call/complaint logs

2&3. LOS & Criticality: Balancing LOS & Cost

- Higher LOS: Higher Costs
- Customer willingness to pay

https://swefc.unm.edu/home/amkan/Chapter4Videos/LS-6.m4v

2&3. LOS & Criticality: Track Progress

- How well are you meeting LOS goal?
- Check on a routine basis
- Report findings to elected officials/upper management and customers
- Question to ask
  - How frequent will the data I need be available?
  - How much time will it take to get the data for tracking?
  - How often do I need to report this type of information to elected officials or the board?
  - How often do I need to communicate with my customers on meeting this goal?
  - How often will it be possible to make adjustments if I find I'm not meeting the goal?

4. Life Cycle Costs

- Cost Types
  - Capital Projects
  - O&M
  - Program Management & Permit Compliance
- Influenced by LOS Goals
- Tally Costs over Time

4. Life Cycle Costs: Informed by LOS Goals

Baseline LOS annual cost (Grand Rapids 2016)

Asset	Inspection	Corrective Maintenance	Preventive Maintenance	System Renewal	Total
Gravity Mains	$0	$200,000	$0	$1,537,000	$1,737,000
Force Mains	Same as pump station inspections	$0	$0	$0	$0
Catch Basins	$0	$600,000	$0	$0	$600,000
Outfalls	$0	$0	$0	$0	$0
Detention Basins	$0	$0	$0	$0	$0
Culverts	$0	$20,000	$0	$0	$20,000
Subtotal of Asset Classes	***$0***	***$820,000***	***$0***	***$1,537,000***	***$2,357,000***
O&M (inspection, corrective and preventive maintenance)					$820,000
Capital Renewal (system renewal)					$1,537,000
Total					**$2,357,000**

4. Life Cycle Costs: Informed by LOS Goals

Low-moderate LOS annual cost (Grand Rapids 2016)

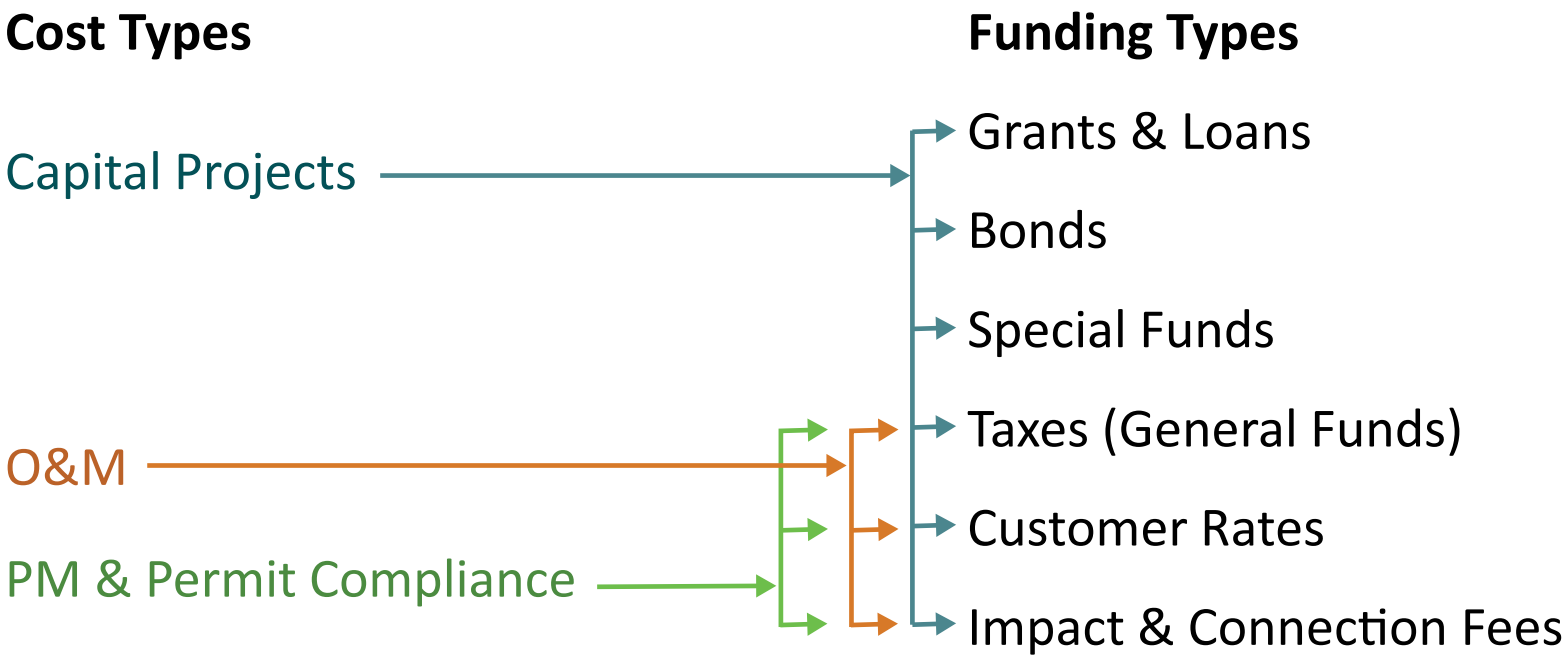
Asset	Inspection	Corrective Maintenance	Preventive Maintenance	System Renewal	Total
Gravity Mains	$110,000	$299,000	$647,000	$2,439,000	$3,495,000
Force Mains	$200			$1,000	$1,200
Catch Basins	$639,000	$24,000	$14,000	$560,000	$1,237,000
Outfalls	$28,000	$66,000	$1,200	$12,000	$107,200
Detention Basins	$6,500			$11,300	$17,800
Culverts	$9,700		$43,000	$11,000	$63,700
Subtotal of asset classes	***$793,400***	***$389,000***	***$705,200***	***$3,034,300***	***$4,921,900***
O&M (inspection, corrective and preventive maintenance)					$1,887,600
Capital Renewal (system renewal)					$3,034,300
Total					**$4,921,900**

4. Life Cycle Costs: Informed by LOS Goals

Advanced LOS annual cost (Grand Rapids 2016)

Asset	Inspection	Corrective Maintenance	Preventive Maintenance	System Renewal	Total
Gravity Mains	$482,000	$996,000	$3,252,000	$8,388,000	$13,118,000
Force Mains	$500	$0	$0	$1,800	$2,300
Catch Basins	$1,276,500	$80,000	$94,000	$1,119,000	$2,569,500
Outfalls	$47,000	$142,000	$27,000	$1,700	$217,700
Detention Basins	$6,500	$0	$0	$22,500	$29,000
Culverts	$19,300	$0	$86,000	$17,000	$122,300
Subtotal of Asset Classes	***$1,831,800***	***$1,218,000***	***$3,459,000***	***$9,550,000***	***$16,058,800***
O&M (inspection, corrective and preventive maintenance)					$6,508,800
Capital Renewal (system renewal)					$9,550,000
Total					**$16,058,800**

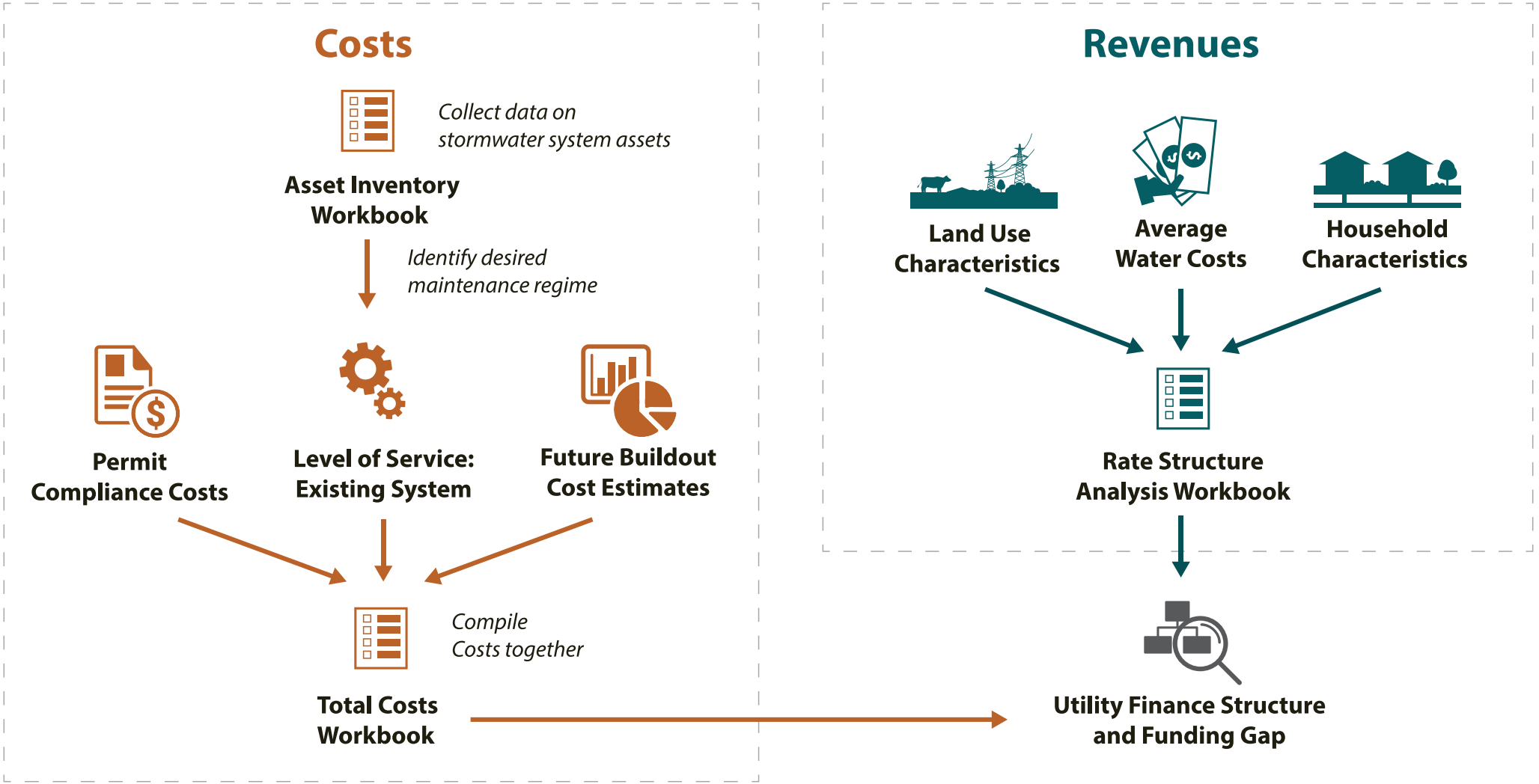
5. Long Term Funding: Costs vs Funding



5. Long Term Funding: Funding Source by Life Cycle Phase

	Rates	Fees	Taxes	Reserves	Partnerships	Incentives	Grands	Loans	Bonds
Planning	✓	✓	✓	✓			✓		
Design	✓	✓	✓	✓	✓		✓	✓	✓
Construction				✓	✓	✓	✓	✓	✓
Operations	✓	✓	✓		✓	✓			
Maintenance	✓	✓	✓		✓	✓			
Repair	✓	✓	✓	✓	✓	✓			
Rehabilitation				✓	✓	✓	✓	✓	✓
Replacement				✓	✓	✓	✓	✓	✓
Disposal	✓	✓	✓	✓					

Stormwater Asset Management and Funding



References/Resources

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- https://efcnetwork.org/
- Maureen.kerner@owp.csus.edu