



Department of Environmental Quality



Asset Management: Coming Down the Pipe

MDEQ – Water Resources Division

Please Note

A number of these slides contain a great deal of script.

It is not my intention to read the details of, for example NPDES Permit language to you during this presentation, but all seminar information is available for review on our website, and in particular the SAW information is available at

<http://www.michigan.gov/deq>

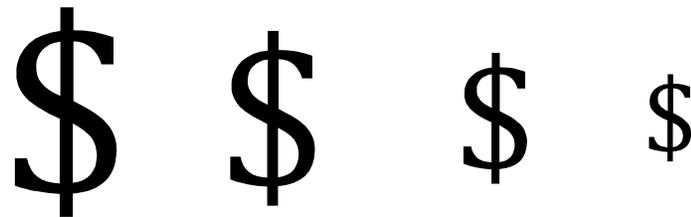
Search for keywords SAW program

Presentation Summary

- * Asset Management (AM) – the what, why, and who?
- * Regulatory Implications
- * Asset Management resources and training

Why are we doing this?

Everyone is in competition for limited funds



What is the Value of our System

It is the ability to **provide service** for the longest time possible for the **least cost**.

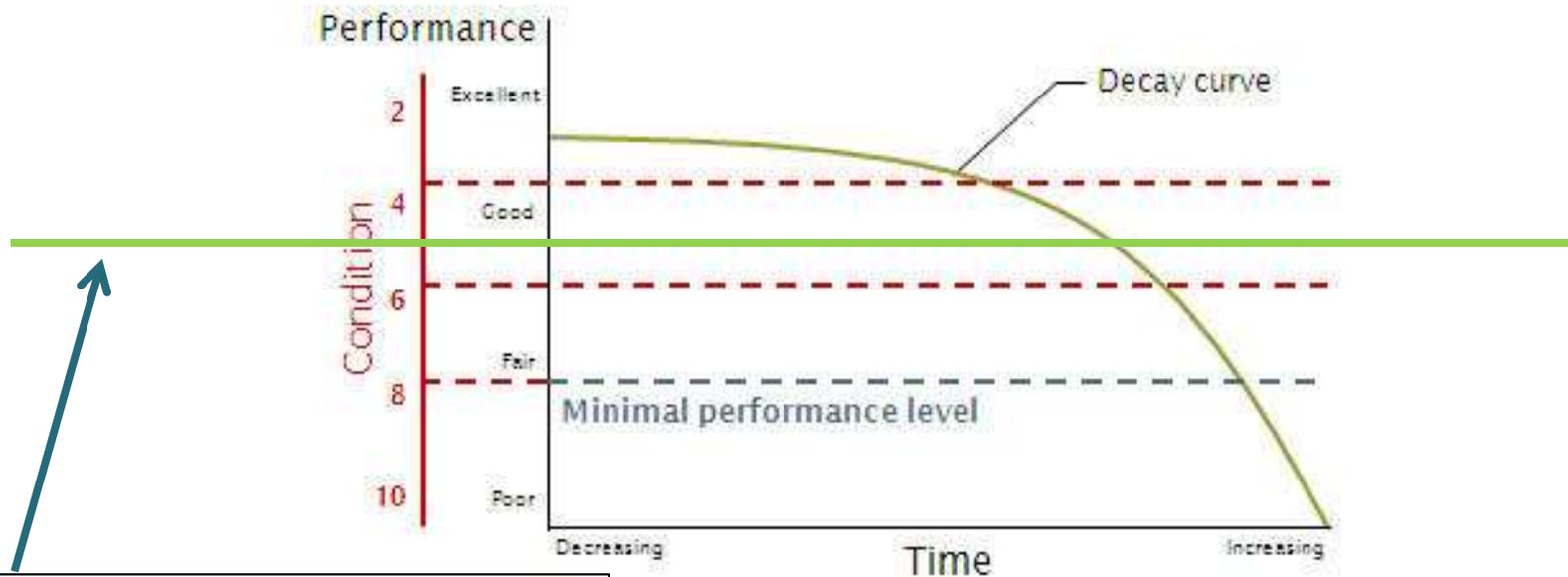
Run to fail



The family car

Analyzing Risk

Tying condition score to asset failure

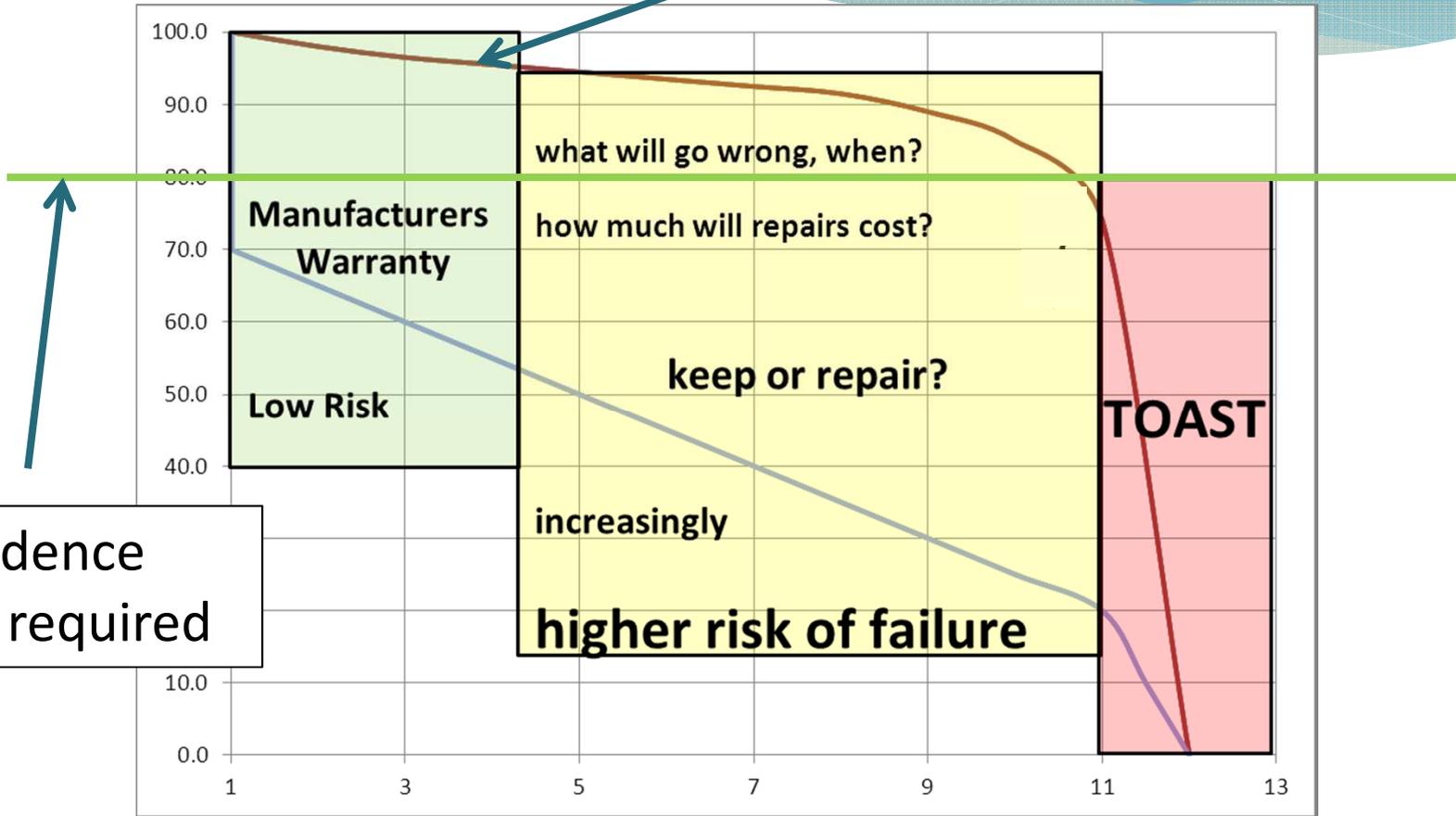


confidence level required

Fundamentals of Asset Management

Run to fail

condition of vehicle



confidence level required

The family car

Analyzing Risk

Design Life of Water Systems

COMPONENTS	YEARS OF DESIGN LIFE
Collections	80–100
Treatment Plants—Concrete Structures	50
Treatment Plants—Mechanical and Electrical	15–25
Force Mains	25
Pumping Stations—Concrete Structures	50
Pumping Stations—Mechanical and Electrical	15
Interceptors	90–100

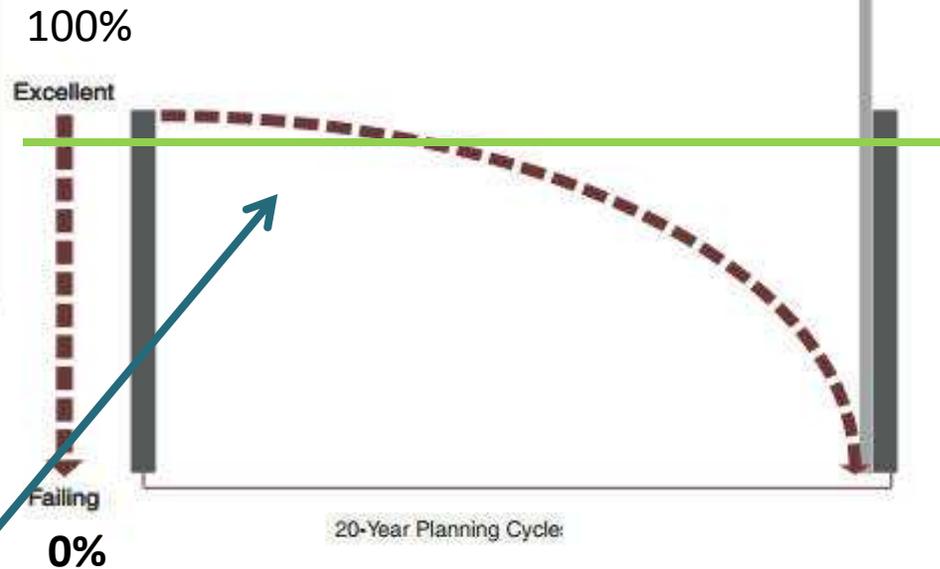
SOURCE Clean Water and Drinking Water Infrastructure
Gap Analysis Report, p. 11, EPA 816-R-02-020, September 2002

Run to Failure

Run-to-Failure Management Model

Sewer system assets that are not regularly maintained usually deteriorate faster than expected and lead to higher replacement and emergency response costs.

- █ Peak Condition
- Asset Decay
- ↑ Rehab/Replacement Cost

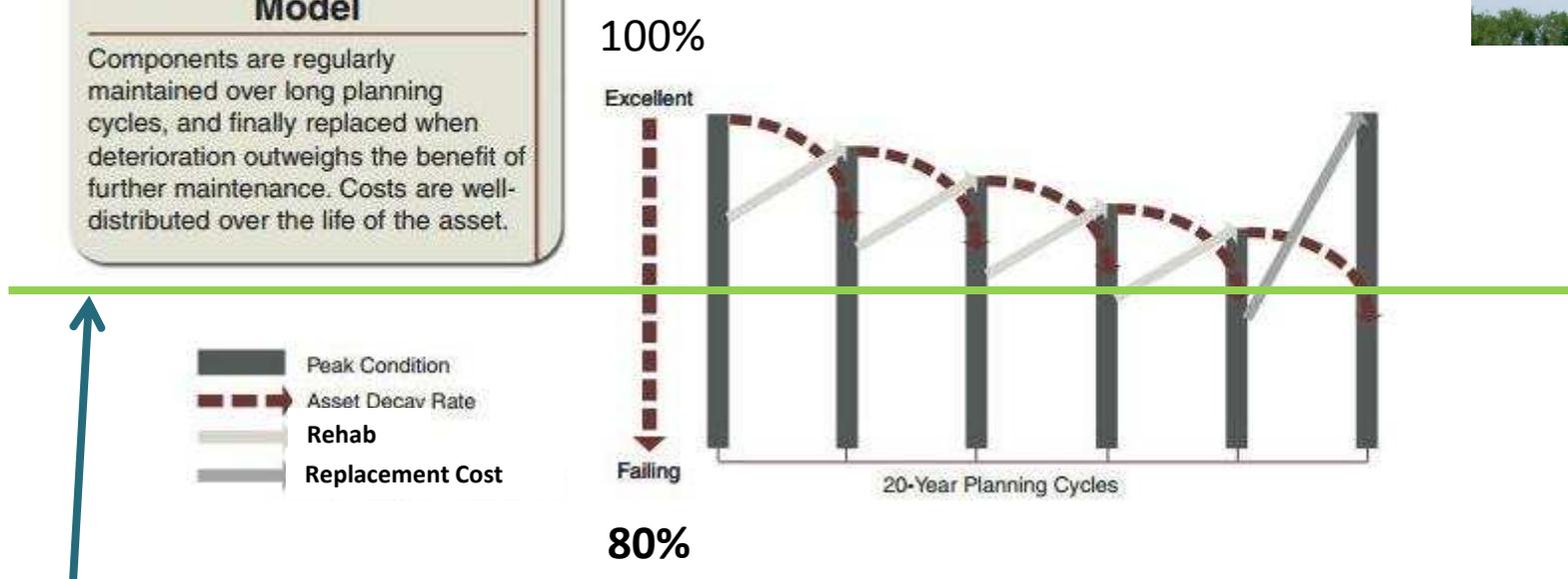


90% confidence level required

Asset Management Model

Asset Management Model

Components are regularly maintained over long planning cycles, and finally replaced when deterioration outweighs the benefit of further maintenance. Costs are well-distributed over the life of the asset.



90% confidence level required

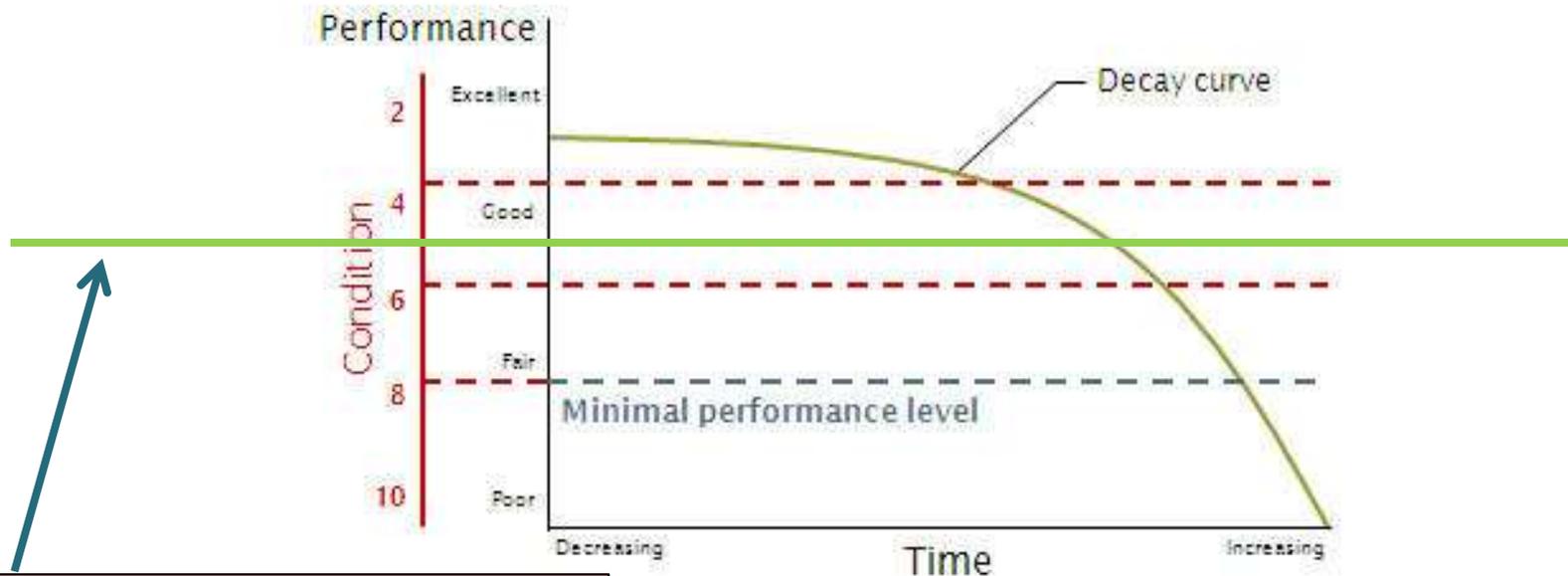
The Asset Management approach

Components are regularly maintained over long planning cycles, and finally replaced when deterioration outweighs the benefit of further maintenance.

Costs are well distributed over the life of the asset.

analyzing risk

Tying condition score to asset failure



confidence level required

Fundamentals of Asset Management

What is an Asset?

It is a maintenance managed item

Maintenance managed item (MMI) is an item at the lowest level—*the smallest subdivision*—of an asset registry composed as a nested hierarchy

Typically, it is the level at which an asset is *maintained* (for example, parts are identified), or *decisions* are made to repair, refurbish, or replace

Think “work order”



Asset



Component

What is an Asset?

In water and wastewater systems, an "asset" is a component of a facility with an independent physical and functional identity and age (e.g., pump, motor, sedimentation tank, main).



Days gone bye

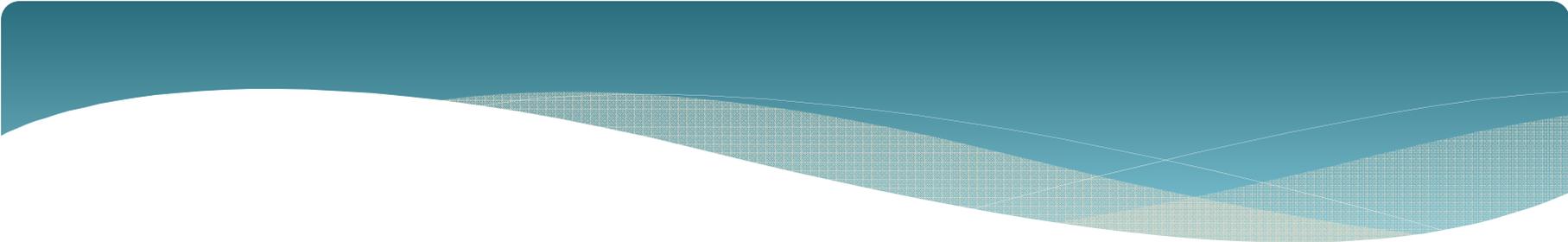
Facilities tracked equipment and scheduled regular maintenance using state of the art scheduling mechanisms



Currently CMMS



**Using a
modern
Computerized
Maintenance
Management
System**



The old style maintenance management systems were primarily based upon elapsed time.

An modern Asset Management System (AM) is predictive based upon criticality, risk, history, active real time data and time

Asset Management Systems can lead to or flow from System wide Enterprise Management Systems

we can do this, in part, because

SCADA: Supervisory Control And Data Acquisition

In the past decade SCADA protocols have been upgraded to allow a broader range of real time monitoring and control of remote facilities.

There can be no doubt that in the future SCADA capabilities will become even more sophisticated.



moving forward

SCADA: Supervisory Control And Data Acquisition



DETECTING POWER GRID SYNCHRONISATION FAILURE ON SENSING FREQUENCY OR VOLTAGE BEYOND ACCEPTABLE RANGE

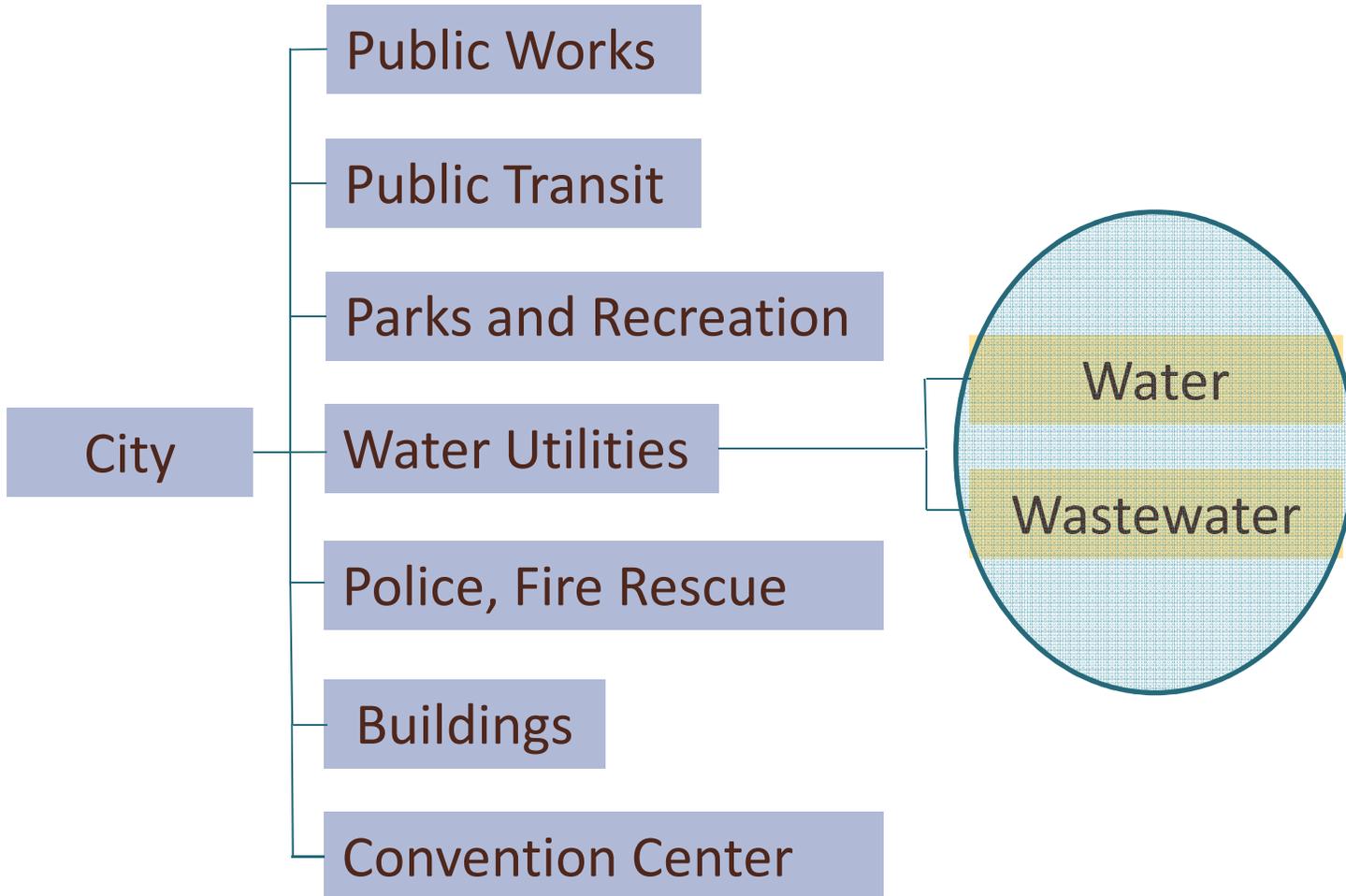
AM – Definition (EPA)

- * **Applied to the entire portfolio of infrastructure assets at all levels of the organization**
- * **Seeking to minimize the total costs of acquiring, operating, maintaining and renewing assets:**
 - * **Within an environment of limited resources**
 - * **While continuously delivering the service levels customers desire and regulators require**
 - * **At an acceptable level of risk to the organization**

Organization UP

Departments

Division



Organization DOWN 1

Division

Water

Wastewater

Collection

Treatment

Disposal

Gravity Sewers

Siphons

Pump Stations

Force Mains

Manholes

Organization DOWN 2

ASSETS

Pump Stations

Pumps and Motors

Wet and Dry Well

Superstructure

Inlet Sewers and Screens

Force Main

Electrical

Controls

Land and Surroundings

The key elements of asset management

- Level of service - **defined**
- Performance goals - **selected**
- Assets – **identified** and **valued**
- Failure - **risk and impact evaluated**
- Condition - **assessed**
- Rehabilitation and replacement - **planned**
- Information system – **in place**
- Capacity – **assessed and assured**
- Maintenance - **planned and analyzed**
- Finances – **actively managed**
- Continuous improvement – **implemented**

Core Questions

AM answers the 5 Core Questions

1. What is the current state of my assets?
2. What is my required "sustainable" level of service?
3. Which assets are critical to sustained performance?
4. What are my minimum life-cycle costs?
5. What is my best long-term funding strategy?

Criticality and Risk

If an item is critical, what is the risk of it not being available

Redundancy plays into this... for example

Pump Station



What is the level of redundancy?

100% ?

Actually it is a little less than 100%

Criticality and Risk

If an item is critical, what is the risk of it not being available

Pump Station

Firm Capacity 2 pumps



What is the level of redundancy?

100% ?

No 50% +/-

Criticality and Risk

If an item is critical, what is the risk of it not being available

Pump Station

Firm Capacity 2 pumps



What is the level of redundancy?

100% ?

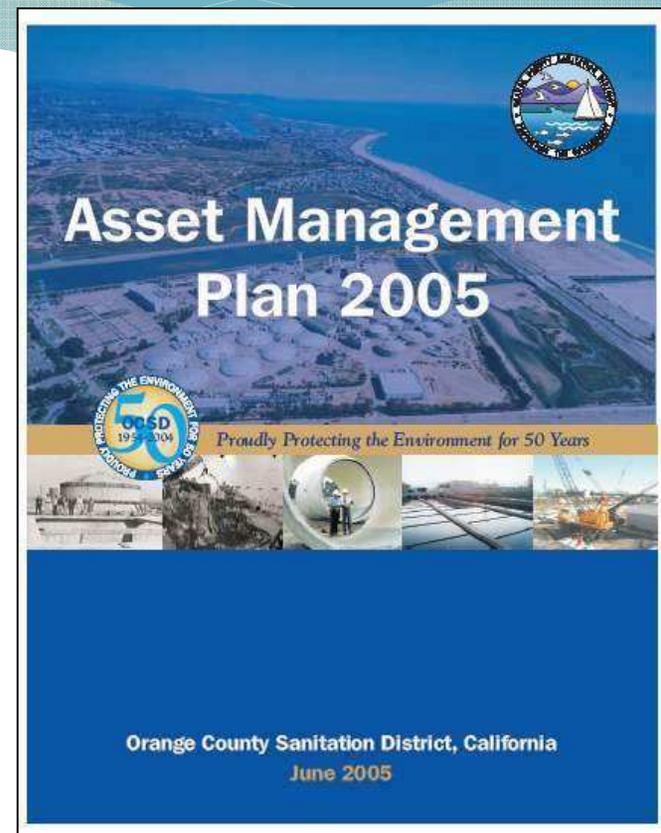
100% +/-

What about firm capacity 3 pumps?

AM Programs

A high-performing asset management program incorporates

- * detailed asset inventories,**
- * operation and maintenance tasks, and**
- * long-range financial planning to build system capacity, and to put systems on the road to sustainability.**



Why Asset Management?



Risk is managed

AM

managing risk in order to spend \$ to best effect

The value of a sewer system is its ability to provide service for the longest time possible for the least cost.

Risk is managed

We manage risk in order to be confident that we are appropriately investing in risk mitigation activities.

We assess and quantify risk and consider the likelihood and consequence of failure when making asset investment and other resource allocation decisions.

We work to understand how likely it will be for something to go wrong and how bad the result will be.

When something has a high likelihood of failing and if it does, will have high consequences, we label that activity as “critical” and based on this, take measures to reduce that risk.

Risk is managed

State of my asset

1. Estimated Effective Life
2. Condition Rating

Which are the Most Critical

1. Probability of Failure
2. Redundancy
3. Consequence of Failure
4. Business Risk Exposure

Level of Service

1. Current Level of Service
2. Required Level of Service

What Strategies

1. Renewal
2. Maintenance
3. Future Maintenance
4. Cost of Renewal

Scoring the Consequence of Failure

Consequence of Failure - Wastewater						
Social/community/ organizational						
Loss of Service - Impact	Can be out of service indefinitely	Cannot be down a month	Cannot be down a week	Cannot be down 1 day	Cannot be down 8 hours	Cannot be down 1 hour
Safety	No impact	Minor inconvenience	Minor injury	Moderate injury and some sickness	Major injury, sickness, some death	Substantial death, widespread injury and sickness
Agency Image	No media or no consequence	Neutral coverage	Adverse media	Widely adverse media	Continual; political opposition	National adverse media
Economic/Financial						
Economics, Hassle Factor	Low cost & low hassle	Low cost & high hassle	High cost; low hassle	High cost, high hassle & diverts \$	Painful change of priorities	Likely trigger rate increase; staff changes
Environmental						
Spill, Flood, Odor	Short duration, sm. qty. onsite: no complaints	Backups; small no. of complaints	Aggressive complaints and liability	Substantial liability, many impacted	Has not appened at this scale before	Sustained, lg. qty., offsite, many complaints
Process & Effluent Quality	No impact: SS; BOD; MPN; Cake	Routine adjustment	Significant corrective action	Significant adj. with uncertainty	Major process recovery with lag time and uncertainty	Loss of process control
Permit compliance	No consequence	Violated daily standard	Violated weekly standard	Violated Monthly Standard	Damage reversible in six months	Permit jeopardized; damage reversible in 5 yrs or more
Score	1	3	5	7	9	10

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Scoring the Consequence of Failure

Organizational

as severe as

Impact of Loss of Service

Cannot be down 1 hour

Safety

Death, widespread injury, sickness

Image

Adverse Media, Adverse National Media

Economic

as severe as

Impact

Rate Increases, de-Hirings

Environmental

as severe as

Spill, Flood, Odor

Sustained, Off-site, Large Quantity, Many Complaints

Effluent Quality

Loss of Process Control

Permit Compliance

Permit Issues, Loss, Fines, Damage not reversible > 5 years

Benefits of Asset Management

- * **Prolong assets**
- * **Meet consumer expectations**
- * **Focus on system sustainability**
- * **Rate setting based on sound operational and financial planning**
- * **Budget focused on activity critical to sustained performance**
- * **Meet regulatory requirements**
- * **Reduce overall costs for both operation and capital expenditures**

Regulatory Implications



Federal Initiatives

- * **AM is a key component to EPA's "Clean Water and Drinking Water Infrastructure Sustainability Policy"**
 - **EPA has issued its Clean Water and Drinking Water Infrastructure Sustainability Policy as part of its efforts to promote sustainable infrastructure within the water sector.**
 - **Major hurdles identified include aging systems in need of significant upgrade and repair.**
 - **Policy emphasizes the need to build on existing efforts to promote sustainable water infrastructure, by employing comprehensive planning efforts such as AM**

Federal Initiatives

- * **EPA Capacity, Management, Operations and Maintenance (CMOM) Programs**
 - * **Main purposes of CMOM are to better manage, operate and maintain collection systems; investigate “bottle necks”; and prevent and respond to SSOs**
 - * **Many CMOM activities are analogous to those of AM**

Federal Initiatives

Government Accounting Standards

Depreciation Doesn't Measure Condition

The value of a sewer system is its ability to provide service for the longest time possible for the least cost. Modified approach accounting offers a way to document in annual financial reports that the system can continue to provide service.

Required for a “Clean Balance Sheet”

Government Accounting Standards

Board Statement 34 (GASB 34)

includes both requirements for reporting of public infrastructure assets in a government's financial statement and options for reporting additional information by governments that use asset management systems. The new rules are designed to establish a basic financial reporting model that will result in greater accountability by state and local governments by providing more useful information to a wider range of users than did the previous model. Communities that opt not to comply with the GASB 34 financial reporting requirements will not present financial statements in accordance with generally accepted accounting principles (GAAP).

State Regulations

- * **Part 41 – Rule 55(1)**

- * **Sewerage systems shall be operated and maintained at all times as efficiently as possible in a manner which minimizes discharges of excessive pollutants.**

State Regulations

- * **NPDES Permits – Part II.D.3, Facilities Operation**
 - * **The permittee shall, at all times, operate and maintain all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit...**

State Initiatives

THROUGH THE NPDES PERMIT

The permit requires the permittee to prepare an Asset Management Program.

The permit requires the permittee to implement the program upon DEQ approval.

The permit requires Annual Reports summarizing program activity.

State Initiatives

THROUGH THE NPDES PERMIT

The permit requires the permittee to includes five core elements which identify:

the current state of the asset,

the desired level of service,

the most critical asset(s) to sustain performance,

the best life cycle cost,

and the long term funding strategy to sustain service and performance.

State Initiatives

THROUGH THE NPDES PERMIT

Permit Requires an AM Program

The requirements of an asset management program listed below contain goals of effective performance, adequate funding, and adequate operator staffing and training. Asset management is a planning process that ensures gaining optimum value for each asset and providing the financial resources to rehabilitate and replace them when necessary; and typically includes five core elements which identify: the current state of the asset, the desired level of service (e.g., per the permit, or for the customer), the most critical asset(s) to sustain performance, the best life cycle cost, and the long term funding strategy to sustain service and performance.

a. The permittee shall prepare and implement an approvable Asset Management Program which addresses the following Operation, Maintenance and Replacement (OM&R)/Asset Management program requirements, 1) – 4). The permittee can choose to include the Operation and Maintenance Manual required under Part II.C.14 of this permit as part of this program. The permittee shall submit a copy of its Asset management Program to the Department for review and approval by _____. The program shall be implemented upon approval.

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State Initiatives

THROUGH THE NPDES PERMIT

Permit Language Requires an AM Program to address:

Staffing

Mapping the Collection System

Inventory and Assessment of Fixed Assets

Budget and Rate Sufficiency

Annual Report

Business Risk Evaluation

State Initiatives

THROUGH THE NPDES PERMIT

Permit Language Requires AM Program to address:

Staffing

1). The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit. The level of staffing needed shall be determined taking into account the work involved in operating the sewer system and treatment works, planning for and conducting maintenance, and complying with this permit.

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State Initiatives

THROUGH THE NPDES PERMIT

Permit Language Requires AM Program to address:

Inventory and Assessment of Fixed Assets

The permittee shall complete an inventory and assessment of operations-related fixed assets. Fixed assets are assets that are normally stationary, for example pumps, blowers, and buildings. The inventory and assessment shall be based on current conditions and shall be kept up-to-date and available for review by the Department. The inventory shall include the following information, a-f:

- a) Brief description of the asset, its required capacity (e.g. pump: 120 gpm), level of redundancy for the asset, and tag number if applicable;
- b) Location of the asset;
- c) Year the asset was installed;
- d) Present condition of the asset (e.g. excellent, good, fair, poor);
- e) Depreciated value of the asset (in 20- dollars);
- f) Current asset (replacement) cost (in 20- dollars);

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State Initiatives

THROUGH THE NPDES PERMIT

Permit Language Requires AM Program to address:

Budget and Rate Sufficiency

The permittee shall complete an assessment of its user rates and replacement fund, including the following:

- a) Beginning and end dates of fiscal year;
- b) Name of the department, committee, board, or other organization that sets rates for the operation of the sewer system and treatment works;
- c) Amount in the permittee replacement fund for year _____;
- d) Replacement fund of all assets with a useful life of 20 years or less;
- e) Expenditures for maintenance, corrective action and capital improvement taken during the fiscal year;
- f) OM&R budget for the fiscal year; and
- g) Rate calculation demonstrating sufficient revenues to cover OM&R expenses.

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State Initiatives

THROUGH THE NPDES PERMIT

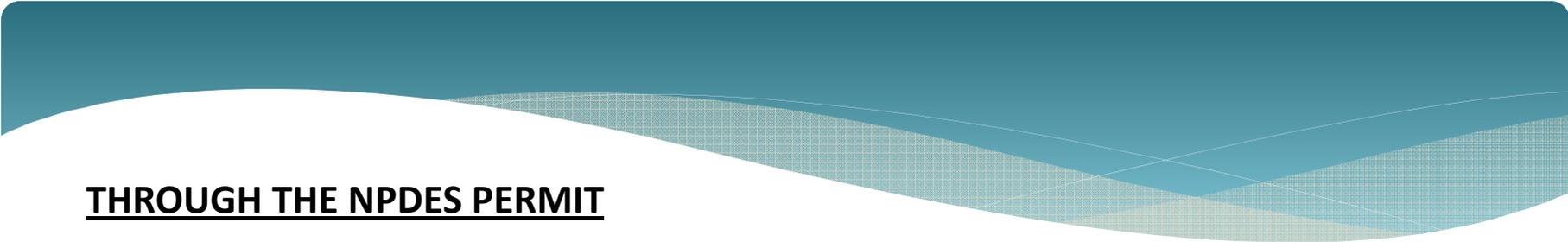
Permit Language Requires AM Program to address:

Annual Report

The permittee shall submit an Annual Report that summarizes Operation, Maintenance & Replacement/Asset Management activities during the previous year and upcoming year. The report shall be submitted to the Department annually by {one month after permittee's fiscal year}. The Annual Report shall include:

- 1) A description of the staffing levels maintained during the year;
- 2) A description of inspections and maintenance activities conducted and corrective actions taken during the previous year;
- 3) Expenditures for collection system maintenance activities, treatment works maintenance activities, corrective actions, and capital improvement during the previous year;
- 4) A summary of asset/areas identified for inspection/action (including capital improvement) in the upcoming year based on core elements (and the Business Risk factors); the current state of the asset; the desired level of service, the most critical asset(s) to sustain performance; and the best life cycle cost;
- 5) A maintenance budget and capital improvement budget for the upcoming year taking into account implementation of an effective asset management program meeting the core elements;
- 6) An updated asset inventory based off of the original submission; and
- 7) An updated OM&R report with updated rate schedule.

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THROUGH THE NPDES PERMIT

Permit Language Requires AM Program to address:

Business Risk Evaluation

The assessment shall consist of a “Business Risk Evaluation” that combines the probability of failure of the asset and criticality of the asset, as follows in g-i:

- g) Rate the probability of failure of the asset on a scale of 1-5 (low to high) using criteria such as maintenance history, failure history, and remaining percentage of useful life (or years remaining).**
- h) Rate the criticality of the asset on a scale of 1-5 (low to high) based on the consequence of failure versus the desired level of service for the facility, and**
- i) Compute the Business Risk factor of the asset by multiplying the failure rating from 1) by the criticality rating from 2).**

Who Should Do Asset Management



State Initiatives

Who Should Do Asset Management?

- Electric and gas utilities are already engaged in AM
- AM is being done for roads.

AM is appropriate for water distribution systems, water treatment plants, wastewater collection systems and wastewater treatment plants

State Initiatives

- * **First up: Detroit Water and Sewerage Department (DWSD) – Current Permit Includes AM Provision**
- * **Then: All Major Municipals reissued in FY13 and the remainder over the next cycle (5 years)**
- * **After that: “Significant” Municipal Minors**

AM Resources & Training



Available Funding Source for AM

- * **State Water Pollution Control Revolving Fund Advisory Committee was established to review and provide recommendations regarding SRF (State Revolving Fund) programs**
- * **Key recommendation: Provide a grant program for design, development and implementation of asset management plans or capital improvement programs for sanitary sewer and storm sewer infrastructure**

\$450 Million

State Initiatives

Stormwater, Asset Management, and Wastewater (SAW) Program Highlights

Department of Environmental Quality

New legislation establishing grants for asset management plan development, stormwater plan development, sewage collection and treatment plan development, and state-funded loans to construct projects identified in the asset management plans.

Grants have \$2M cap per municipality. First million has 10-percent local match; second million has 25-percent local match. The local match is not eligible for loan assistance.

Municipalities that are considered disadvantaged by the DEQ, in receivership, operating under an emergency manager, or operating under a consent agreement under the Local Government Fiscal Responsibility Act can receive a 100- percent grant with no local match required. Additionally, these communities can expend up to \$500,000 in grant funds for the construction of projects identified in an asset management plan.

Grant recipient must proceed with a project for which grant funding is provided within 3 years of grant award or face repayment of the grant plus interest. For the asset management grant, this means significant progress as determined by the DEQ toward achieving the funding structure to implement the asset management program.

Funds are awarded to grant and loan recipients on a first come, first served basis.

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Search for keywords SAW program

AM Training

- * EPA AM Webpage
 - * Workshops
 - * Web training/webinars
- * DEQ
 - * Water/Wastewater AM Seminars



EPA Resources

- * EPA has a Sustainable Infrastructure webpage devoted to water and wastewater systems:
 - * <http://water.epa.gov/infrastructure/sustain/>
 - * Click on “Asset Management”
- * Includes links to a number of AM guidance documents
 - * “Asset Management: A Best Practices Guide”
 - * “Building an Asset Management Team”
 - * “Asset Management: A Handbook for Small Public Water Systems—STEP Guide Series”

EPA Resources

Check Up Program for Small Systems (CUPSS)

- * **Free Software**
- * **AM tool for small drinking water and wastewater utilities**
- * **Aids in development of:**
 - * **A record of your assets;**
 - * **A schedule of required tasks;**
 - * **An understanding of your financial situation;**
 - * **A tailored asset management plan.**

EPA Resources

Check Up Program for Small Systems (CUPSS)

the CUPSS Users Guide and the Self-Paced Training lessons available at <http://www.epa.gov/dwcapacity/information-check-program-small-systems-cupss-asset-management-tool>

EPA Resources

Check Up Program for Small Systems (CUPSS) example training lessons

- * **Session 1:** Learn how to set up the utility's basic information, navigating CUPSS, create an asset inventory, and create a customized asset report.
- * **Session 2:** Create operation and maintenance tasks, learn how to search and print reports on assets and associated tasks, and enter annual financial statements to determine a 10 year financial projection.
- * **Session 3:** Become familiar with the steps in developing an asset management plan and learn about the different troubleshooting tips to help you get the most out of CUPSS.

DEQ Resources

- * **District NPDES Compliance Staff**
- * **Permits Section**
 - * **Matt Staron: 517-335-4491 and staronm@michigan.gov**
- * **Statewide Part 41 Coordinator**
 - * **Charlie Hill: 346-8528 and hillc@michigan.gov**

please remember

The value of a sewer system is its ability to provide service for the longest time possible for the least cost.

Before a major paving project, check the condition of underground utilities, and refresh them as necessary

Questions?

