

Protecting Information Assets

- Unit# 9 -

Business Continuity and Disaster Recovery Planning

Agenda

- In The News
- Business Continuity and Disaster Recovery Planning
- Test Taking Tip
- Quiz

Business Continuity

Capability to continue service delivery at acceptable levels following” natural or human-induced disaster

Source: International Standards Organization 22300:2018

Security and resilience - Vocabulary

Resiliency

“Capacity to recover quickly from difficulties

...

Antonyms:

- Vulnerability, weakness...”

Source: <https://www.lexico.com/en/synonym/resilience>

Disaster Context

- *Disruptions to operations can occur with or without warning*
- *Results may be predictable or unanticipated*

The first priority is always the safety of the people:

- *Employees*
- *Service and Support Staff*
- *Visitors*

```
File Edit Format View Help
Your network has been penetrated.

All files on each host in the network have been encrypted with a strong algorithm.
Backups were either encrypted or deleted or backup disks were formatted.
Shadow copies also removed, so F8 or any other methods may damage encrypted data but not recover.

We exclusively have decryption software for your situation
No decryption software is available in the public.

DO NOT RESET OR SHUTDOWN - files may be damaged.
DO NOT RENAME OR MOVE the encrypted and readme files.
DO NOT DELETE readme files.
This may lead to the impossibility of recovery of the certain files.

To get info (decrypt your files) contact us at
wayneEvenson@protonmail.com
or
wayneEvenson@tutanota.com

BTC wallet:
14hVkm7Ft2rxDBFTNkkRC3kGstMgp2A4hk

Ryuk
No system is safe
```



Business Continuity Management

The **Business Continuity Plan (BCP)** is developed to help assure the organization's ability to maintain, resume, and recover the business

- *It is not just about recovering information technology capabilities*

Planning focuses on the entire enterprise's mission critical infrastructure

- People
- Processes
- Technology

To assure resilient response, organizations need...

Business Continuity Plan (BCP)

Documented procedures for recovering and resuming critical operational functions following significant disruption

Source: ISO 22301:2012

Societal security – Business continuity management systems - Requirements

...includes a Disaster Recovery Plan (DRP)

Procedures for relocating critical information systems operations to an alternative site following significant disruption

Case study: MAERSK shipping

- 2016 – Maersk shipping company’s senior system administrators warn company that its network of 80,000+ computers was vulnerable to attack
- Windows 2000 servers and Windows XP computers overdue for replacement
 - Leadership approved upgrades, but systems administrators not motivated to implement the upgrades (due to bonuses based on “uptime” and not security)
 - ***No contingency planning (no Disaster Recovery Plan)***



2017, March – Microsoft issues emergency patch to update systems and protect from NotPetya, Maersk’s systems not upgraded or patched to protect from NotPetya virus/malware

- 2017, June – NotPetya encryption attack hits Maersk’s offices in Ukraine (arrived as infected e-mail attachments)
- ***Rapidly spreads through Maersk’s global wide area network resulting in complete IT availability loss***
 - Active directory domain controllers (network of 150) providing login information (i.e. usernames & passwords) and access control authorization information all wiped out
 - 1 Active Directory domain controller in Ghana unaffected due to being off the internet due to electricity blackout
 - Resulting in 10-days of lost business (\$300,000,000 in expenses and lost earnings)

2017, July – System upgraded (4,000 new servers, 45,000 new PC’s, with 2,500 applications) and computer-based business processes restored

Availability is the focus of BCP & DRP

	POTENTIAL IMPACT		
Security Objective	LOW	MODERATE	HIGH
Confidentiality Preserving authorized restrictions on information access and disclosure, including means for	The unauthorized disclosure of information could be expected to have a limited adverse effect on organizational operations.	The unauthorized disclosure of information could be expected to have a serious adverse effect on organizational operations.	The unauthorized disclosure of information could be expected to have a severe or catastrophic adverse effect on

FIPS PUB 199

FEDERAL INFORMATION PROCESSING STANDARDS PUBLICATION

Standards for Security Categorization of Federal Information Systems

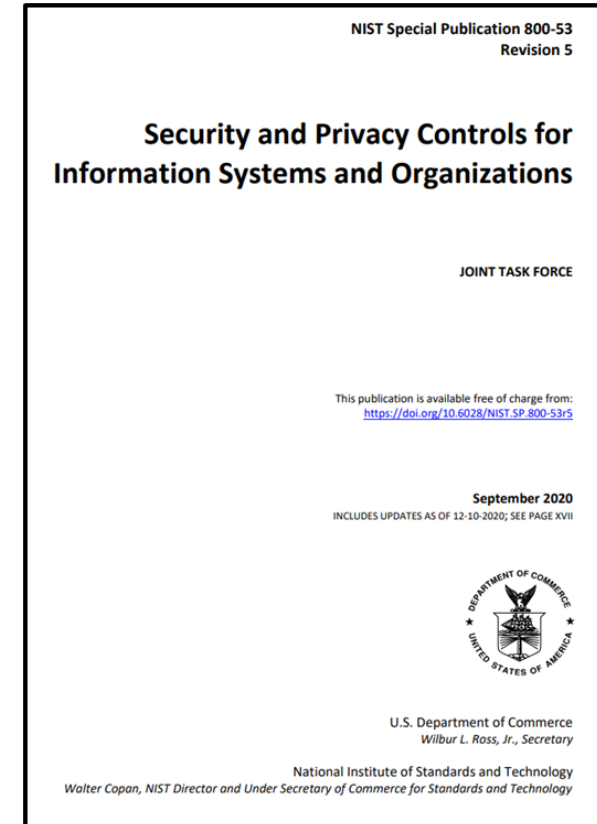
	POTENTIAL IMPACT		
Security Objective	LOW	MODERATE	HIGH
Availability Ensuring timely and reliable access to and use of information. [44 U.S.C., SEC. 3542]	The disruption of access to or use of information or an information system could be expected to have a limited adverse effect on organizational operations, organizational assets, or individuals.	The disruption of access to or use of information or an information system could be expected to have a serious adverse effect on organizational operations, organizational assets, or individuals.	The disruption of access to or use of information or an information system could be expected to have a severe or catastrophic adverse effect on organizational operations, organizational assets, or individuals.

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Business Continuity and Disaster Recovery planning focuses on Contingency Planning controls

...other controls play important roles in assuring effective contingency planning and disaster recovery!

CLASS	FAMILY
Management	Risk Assessment
Management	Planning
Management	System and Services Acquisition
Management	Certification, Accreditation, and Security Assessments
Operational	Personnel Security
Operational	Physical and Environmental Protection
Operational	Contingency Planning
Operational	Configuration Management
Operational	Maintenance
Operational	System and Information Integrity
Operational	Media Protection
Operational	Incident Response
Operational	Awareness and Training
Technical	Access Control
Technical	Audit and Accountability
Technical	System and Communications Protection



Business Continuity Plan (BCP)

3 Phases of disaster contingency response :

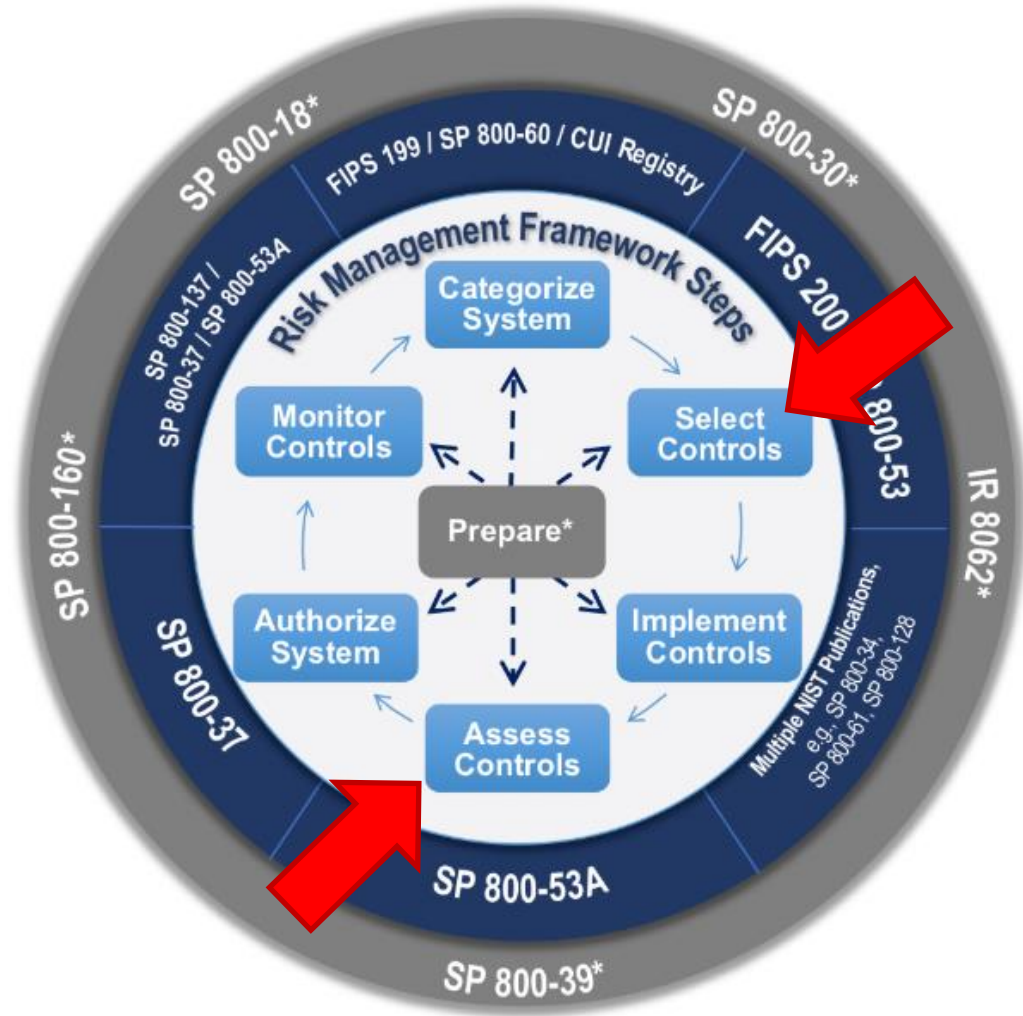
1. Activation and Notification

- i. Activation criteria
- ii. Notification procedures
- iii. Outage assessment

2. Recovery - Disaster Recovery Plan (DRP)

- i. Sequence of recovery activities
- ii. Recovery procedures

3. Reconstitution




NIST Special Publication 800-53
 Revision 5

Security and Privacy Controls for Information Systems and Organizations

JOINT TASK FORCE

This publication is available free of charge from:
<https://doi.org/10.6028/NIST.SP.800-53r5>

September 2020
 INCLUDES UPDATES AS OF 12-10-2020; SEE PAGE XVII



U.S. Department of Commerce
 Wilbur L. Ross, Jr., Secretary

National Institute of Standards and Technology
 Walter Copan, NIST Director and Under Secretary of Commerce for Standards and Technology


DRAFT NIST Special Publication 800-53A
 Revision 5

Assessing Security and Privacy Controls in Information Systems and Organizations

JOINT TASK FORCE

This publication is available free of charge from:
<https://doi.org/10.6028/NIST.SP.800-53Ar5-draft>

August 2021



U.S. Department of Commerce
 Gina M. Raimondo, Secretary

National Institute of Standards and Technology
 James K. Olthoff, Performing the Non-Exclusive Functions and Duties of the Under Secretary of Commerce for Standards and Technology & Director, National Institute of Standards and Technology

Control Baselines for Information Systems and Organizations

JOINT TASK FORCE

This publication is available free of charge from:
<https://doi.org/10.6028/NIST.SP.800-53B>

October 2020
 INCLUDES UPDATES AS OF 12-10-2020; SEE PAGE XI



U.S. Department of Commerce
 Wilbur L. Ross, Jr., Secretary

National Institute of Standards and Technology
 Walter Copan, NIST Director and Under Secretary of Commerce for Standards and Technology

Contingency Planning (CP)

CONTROL NUMBER	CONTROL NAME CONTROL ENHANCEMENT NAME	PRIVACY CONTROL BASELINE	SECURITY CONTROL BASELINES			CONTROL NUMBER	CONTROL NAME CONTROL ENHANCEMENT NAME	PRIVACY CONTROL BASELINE	SECURITY CONTROL BASELINES		
			LOW	MOD	HIGH				LOW	MOD	HIGH
CP-1	Policy and Procedures		x	x	x	CP-8(2)	SINGLE POINTS OF FAILURE			x	x
CP-2	Contingency Plan		x	x	x	CP-8(3)	SEPARATION OF PRIMARY AND ALTERNATE PROVIDERS				x
CP-2(1)	COORDINATE WITH RELATED PLANS			x	x	CP-8(4)	PROVIDER CONTINGENCY PLAN				x
CP-2(2)	CAPACITY PLANNING				x	CP-8(5)	ALTERNATE TELECOMMUNICATION SERVICE TESTING				
CP-2(3)	RESUME MISSION AND BUSINESS FUNCTIONS			x	x	CP-9	System Backup		x	x	x
CP-2(4)	RESUME ALL MISSION AND BUSINESS FUNCTIONS		W: Incorporated into CP-2(3).			CP-9(1)	TESTING FOR RELIABILITY AND INTEGRITY			x	x
CP-2(5)	CONTINUE MISSION AND BUSINESS FUNCTIONS				x	CP-9(2)	TEST RESTORATION USING SAMPLING				x
CP-2(6)	ALTERNATE PROCESSING AND STORAGE SITES										
CP-2(7)	COORDINATE WITH EXTERNAL SERVICE PROVIDERS										
CP-2(8)	IDENTIFY CRITICAL ASSETS										
CP-3	Contingency Training										
CP-3(1)	SIMULATED EVENTS										
CP-3(2)	MECHANISMS USED IN TRAINING ENVIRONMENTS										
CP-4	Contingency Plan Testing										
CP-4(1)	COORDINATE WITH RELATED PLANS										
CP-4(2)	ALTERNATE PROCESSING SITE										
CP-4(3)	AUTOMATED TESTING										
CP-4(4)	FULL RECOVERY AND RECONSTITUTION										
CP-4(5)	SELF-CHALLENGE										
CP-5	Contingency Plan Update										
CP-6	Alternate Storage Site										
CP-6(1)	SEPARATION FROM PRIMARY SITE										
CP-6(2)	RECOVERY TIME AND RECOVERY POINT OBJECTIVES										
CP-6(3)	ACCESSIBILITY										
CP-7	Alternate Processing Site										
CP-7(1)	SEPARATION FROM PRIMARY SITE										
CP-7(2)	ACCESSIBILITY										
CP-7(3)	PRIORITY OF SERVICE										
CP-7(4)	PREPARATION FOR USE										
CP-7(5)	EQUIVALENT INFORMATION SECURITY SAFEGUARDS										
CP-7(6)	INABILITY TO RETURN TO PRIMARY SITE										
CP-8	Telecommunications Services										
CP-8(1)	PRIORITY OF SERVICE PROVISIONS										

CONTROL NAME	BASELINES		
	LOW	MOD	HIGH
Contingency Planning Policy and Procedures	X	X	X
Contingency Plan	X	X	X
Contingency Training	X	X	X
Contingency Plan Testing	X	X	X
Alternative Storage Site		X	X
Alternative Processing Site		X	X
Telecommunications Services		X	X
Information System Backup	X	X	X
Information System Recovery and Reconstitution	X	X	X

CP-2	CONTINGENCY PLAN
	ASSESSMENT OBJECTIVE: <i>Determine if the organization:</i>

ASSESSMENT OBJECTIVE:
Determine if the organization:

NIST Spec

Assessing Security Controls in Federal Systems and (Building Eff

TR

This

CP-2(a)	<i>develops and documents a contingency plan for the information system that:</i>	
CP-2(a)(1)	<i>identifies essential missions and business functions and associated contingency requirements;</i>	
CP-2(a)(2)	CP-2(a)(2)[1]	<i>provides recovery objectives;</i>
	CP-2(a)(2)[2]	<i>provides restoration priorities;</i>
	CP-2(a)(2)[3]	<i>provides metrics;</i>
CP-2(a)(3)	CP-2(a)(3)[1]	<i>addresses contingency roles;</i>
	CP-2(a)(3)[2]	<i>addresses contingency responsibilities;</i>
	CP-2(a)(3)[3]	<i>addresses assigned individuals with contact information;</i>
CP-2(a)(4)	<i>addresses maintaining essential missions and business functions despite an information system disruption, compromise, or failure;</i>	
CP-2(a)(5)	<i>addresses eventual, full information system restoration without deterioration of the security safeguards originally planned and implemented;</i>	
CP-2(a)(6)	CP-2(a)(6)[1]	<i>defines personnel or roles to review and approve the contingency plan for the information system;</i>
	CP-2(a)(6)[2]	<i>is reviewed and approved by organization-defined personnel or roles;</i>

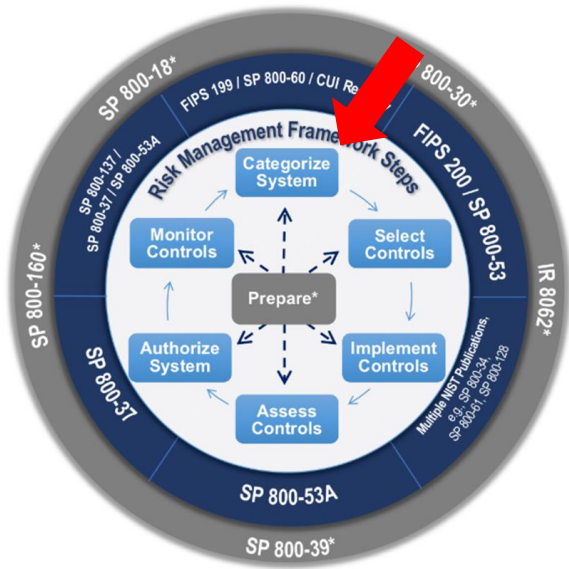
*in for the information system that:
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safeguards originally planned and
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roles;
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istributed;
tingency plan to organization-defined
nd organizational elements;
es with incident handling activities;
v the contingency plan for the
1 with the organization-defined
information system, or environment of*

	CP-2(e)[2]	<i>problems encountered during plan implementation, execution, and testing;</i>
CP-2(f)	CP-2(f)[1]	<i>defines key contingency personnel (identified by name and/or by role) and organizational elements to whom contingency plan changes are to be communicated;</i>

Identifying essential missions and business functions

An important and big topic:

- How to maintain the continued operation of the business' mission critical processes?
- Based on conducting a **Business Impact Analysis (BIA)**
 - Process of analyzing activities and the effect that a business disruption might have upon them



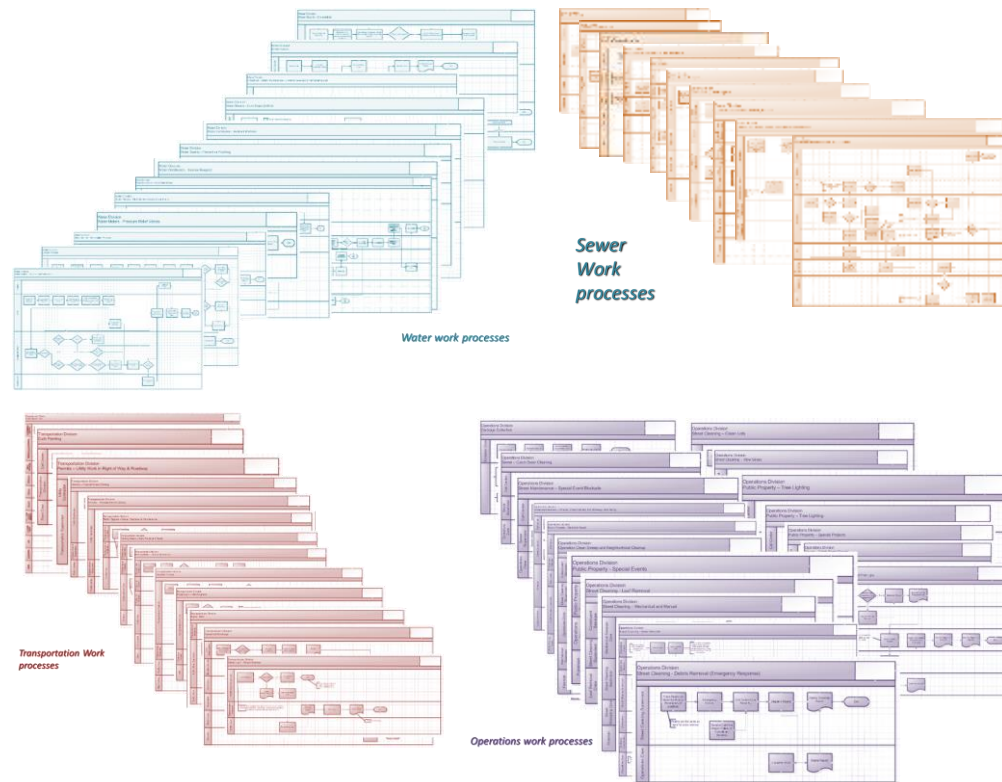
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Business Impact Analysis (BIA) answers...

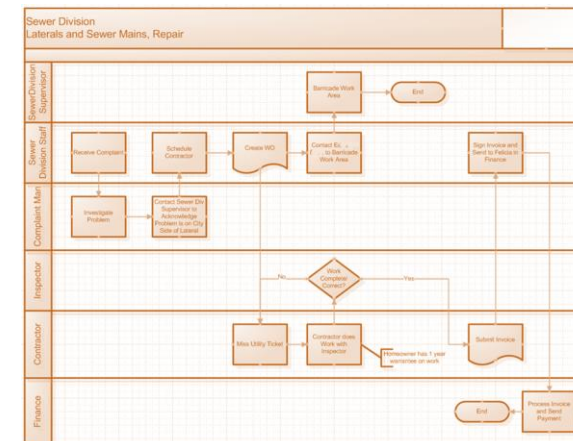
1. What are the work processes ?
2. How critical is each ?
 - *Assess impacts of not performing these activities over time;*
3. How quick do each need to be recovered?
 - *Prioritize the timeframe for resuming each activity at a specified minimum acceptable level, consider how long before the impacts of not resuming each would become unacceptable*
4. What data, applications, people, 3rd parties (e.g. suppliers, partners, ...) are needed to run each critical process ?

Prerequisite for Business Impact Analysis and Disaster Recovery Planning

Good work process documentation identifying all people, data, applications, communications and information technologies needed to restore operations



		Transportation Division	Sewer Division	Water Division	Water Quality	Operations Division	Other
Work Types	Public						
	Internal						
Transportation Division	Sign, Message, Directional						
	Street Light Repair/Replace						
	Street Light Pole						
	Traffic Signal Installation/Maintenance						
	Traffic Signal Pole						
	Parking Meter Base						
	Public Street Sign, Signs and Regs.						
	Personnel Manning						
	Cost Study						
	Quality Work						
Operations Division	Minor Street						
	Street Cleaning - Mechanical and Manual						
	Street Cleaning - Mechanical						
	Street Cleaning - Manual						
	Street Cleaning - Emergency Response						
	Street Cleaning - Public Property						
	Leaf Removal						
	Operations - Close Street and Neighboring Closure						
	Special Events						
	Special Projects						
Water Division	Minor System and Complaints						
	Minor - New System						
	Minor - Repair						
	Minor - Replace Valve						
	Minor - Replace Meter						
	Minor - Replace Meter						
	Minor - Replace Meter						
	Minor - Replace Meter						
	Minor - Replace Meter						
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Sewer Division	Lateral and Sewer Main, Repair (CIP)						
	Lateral and Sewer Main, Repair (CIP)						
	Lateral and Sewer Main, Repair (CIP)						
	Lateral and Sewer Main, Repair (CIP)						
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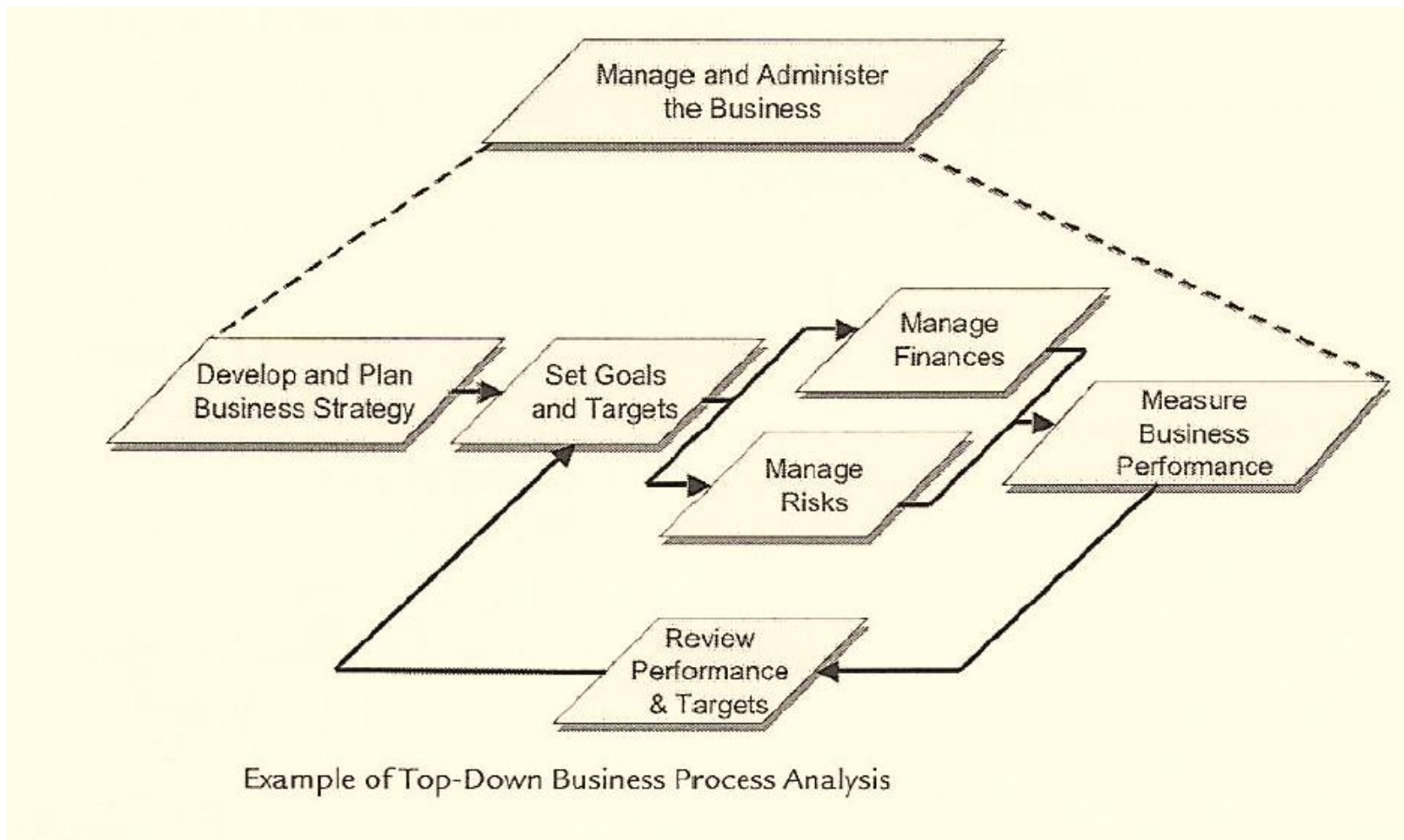
Meta-level view of information processing in large enterprises

There may be 5 or 10 high-level business processes (“meta-processes”), for example:

1. *Develop product offerings*
2. *Bring product offerings to market*
3. *Acquire customer orders*
4. *Fulfill customer orders*
5. *Manage the business*
 - *For example has 6 sub-processes...*

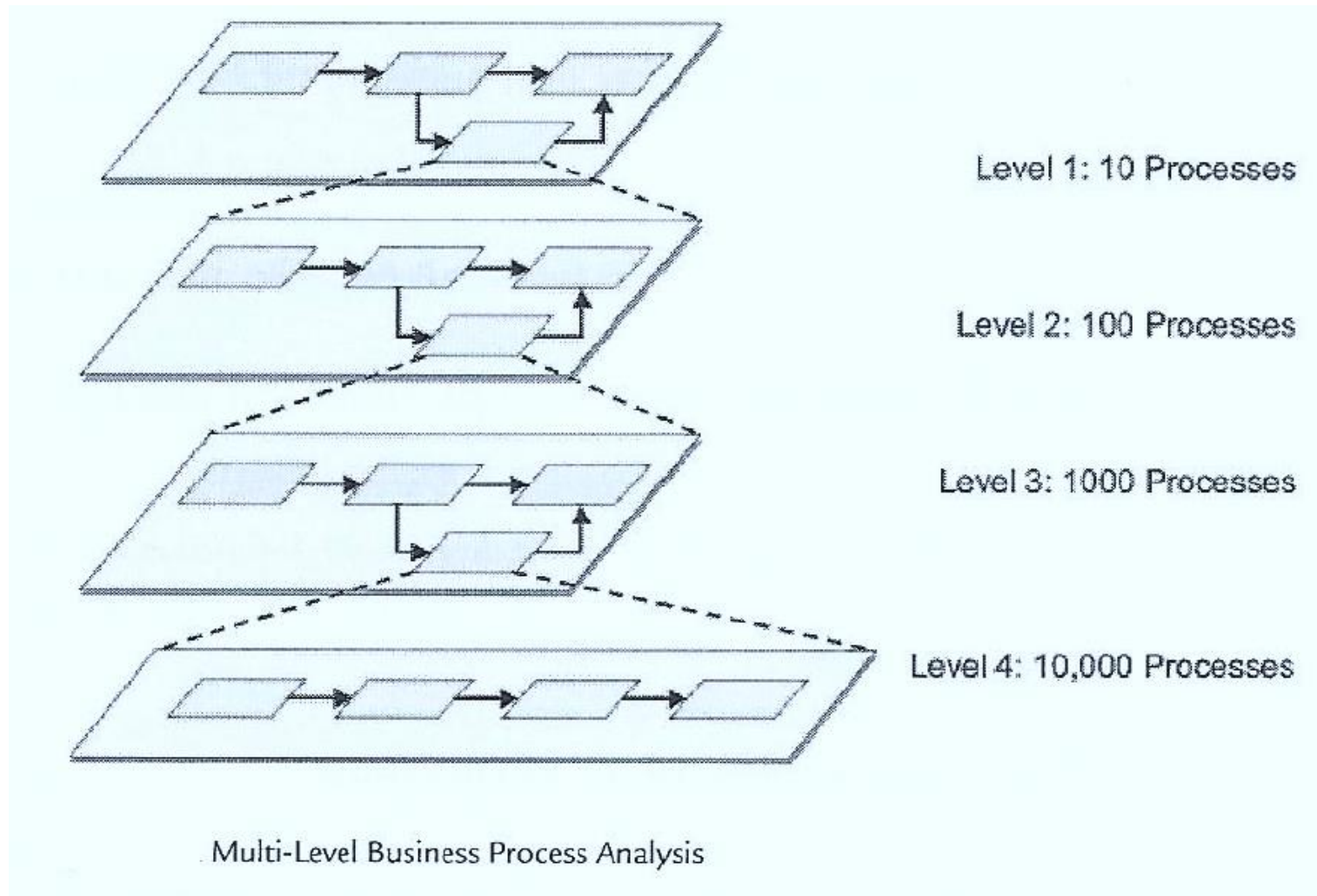
Sherwood, J., Clark, A. and Lynas D. (2005)

“Manage the business”



Top-down business process analysis

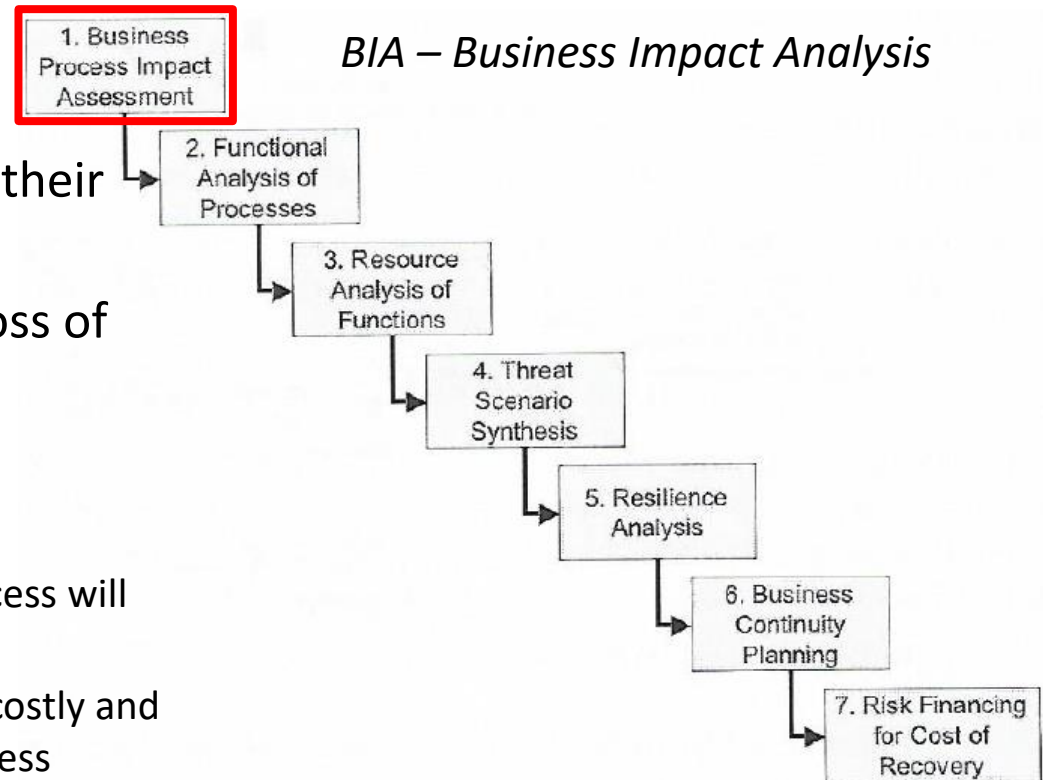
Also known as: *Structured decomposition*



Auditing the Business Continuity Plan

Step 1

- Has the business identified and mapped their business processes?
- Have they assessed business impact of loss of each business process?
- Have they classified and ranked business processes into 3 or 4 prioritized groups?
 1. **High** (Catastrophic/Severe) – Loss of this process will result in deaths and/or destroy the business
 2. **Moderate** (Serious) – Loss will be extremely costly and cause persistent, severe damage to the business
 3. **Low** (limited) – Loss will impact the business
 4. **Other** – Damage caused by loss of this process can be absorbed



Sherwood, J., Clark, A. and Lynas D. (2005), Enterprise Security Architecture, CRC Press

Does the organization have an inventory of work processes supported by each information system ?

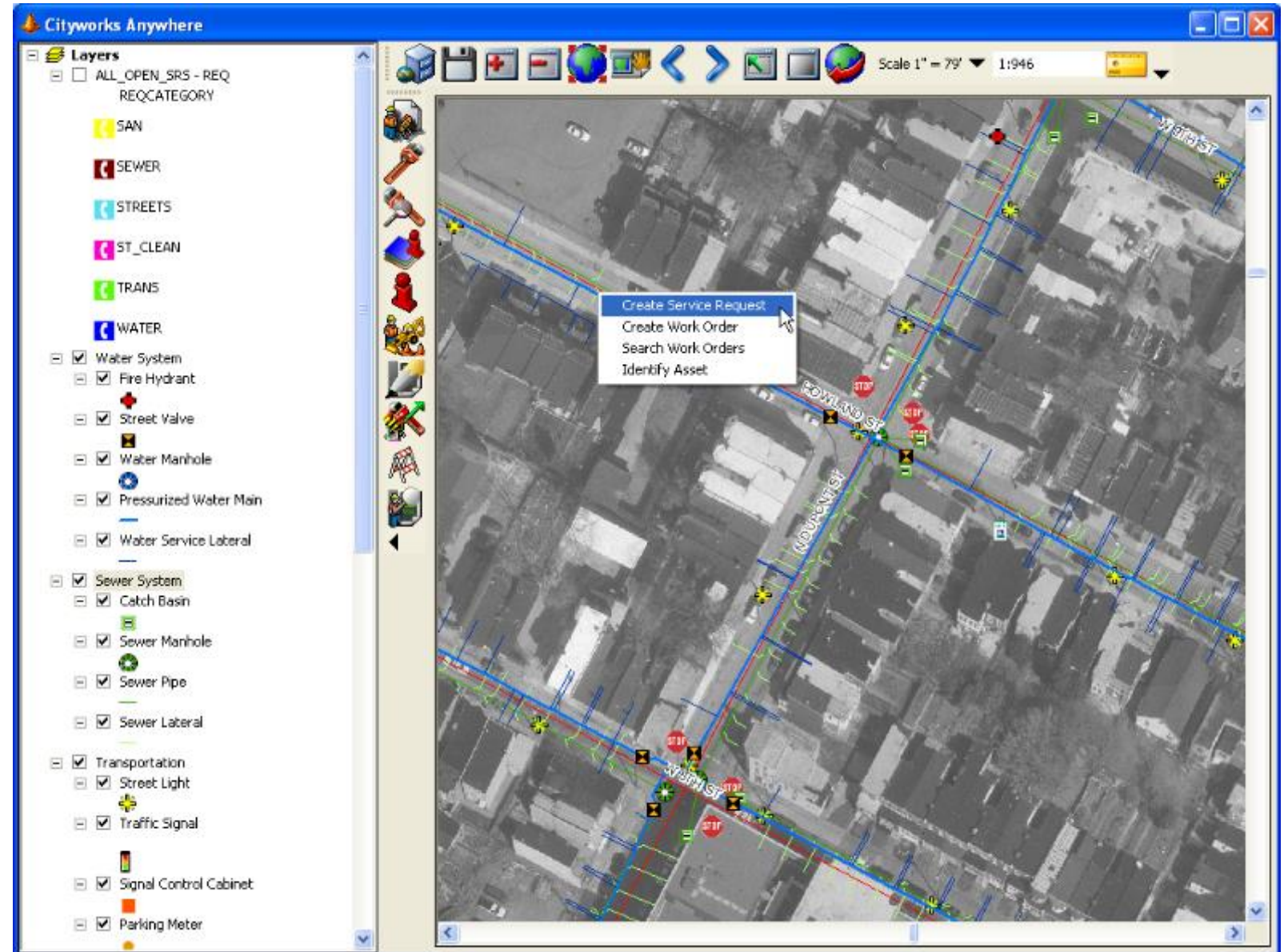
Example:

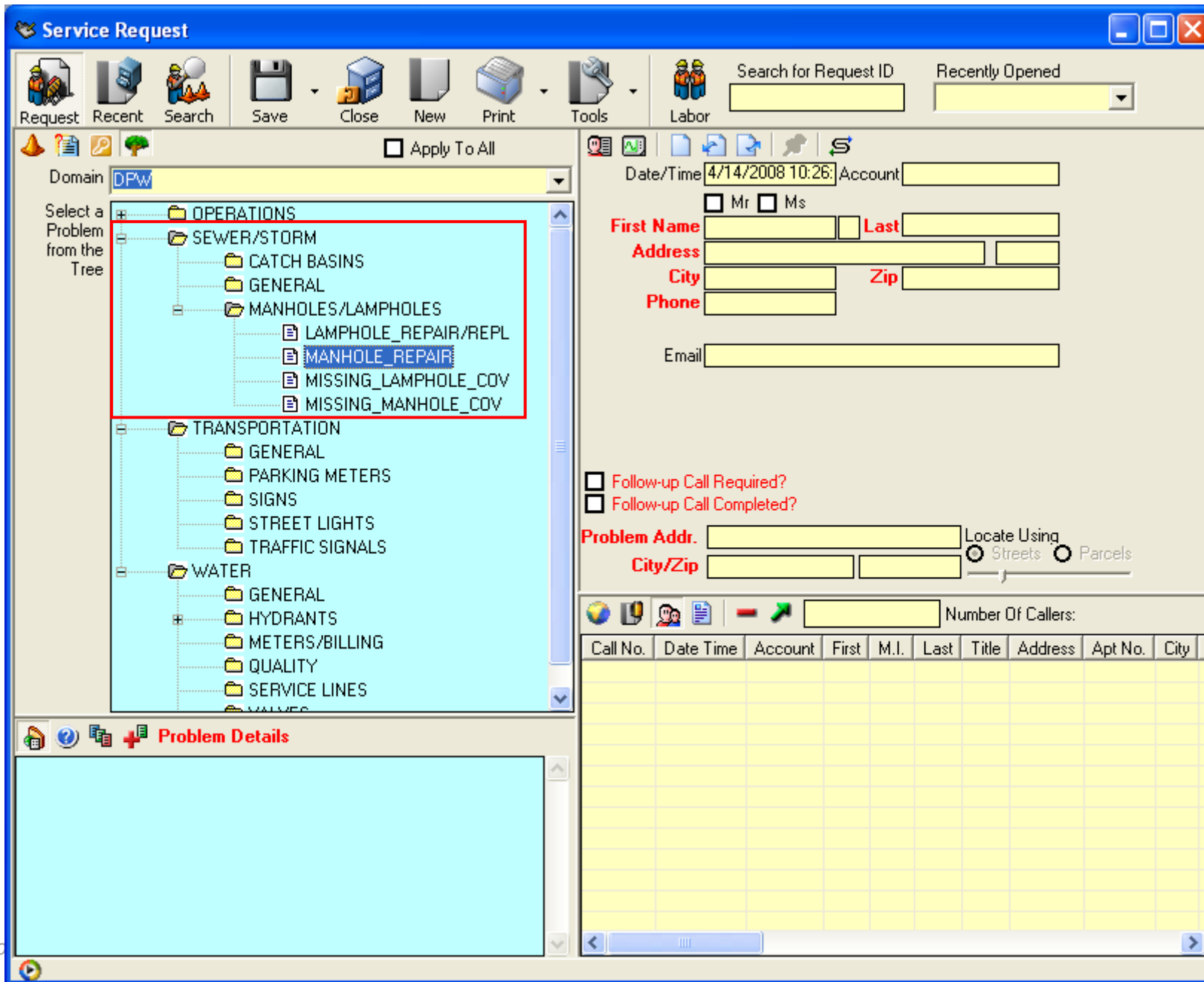
Service request and utility maintenance management work order information system

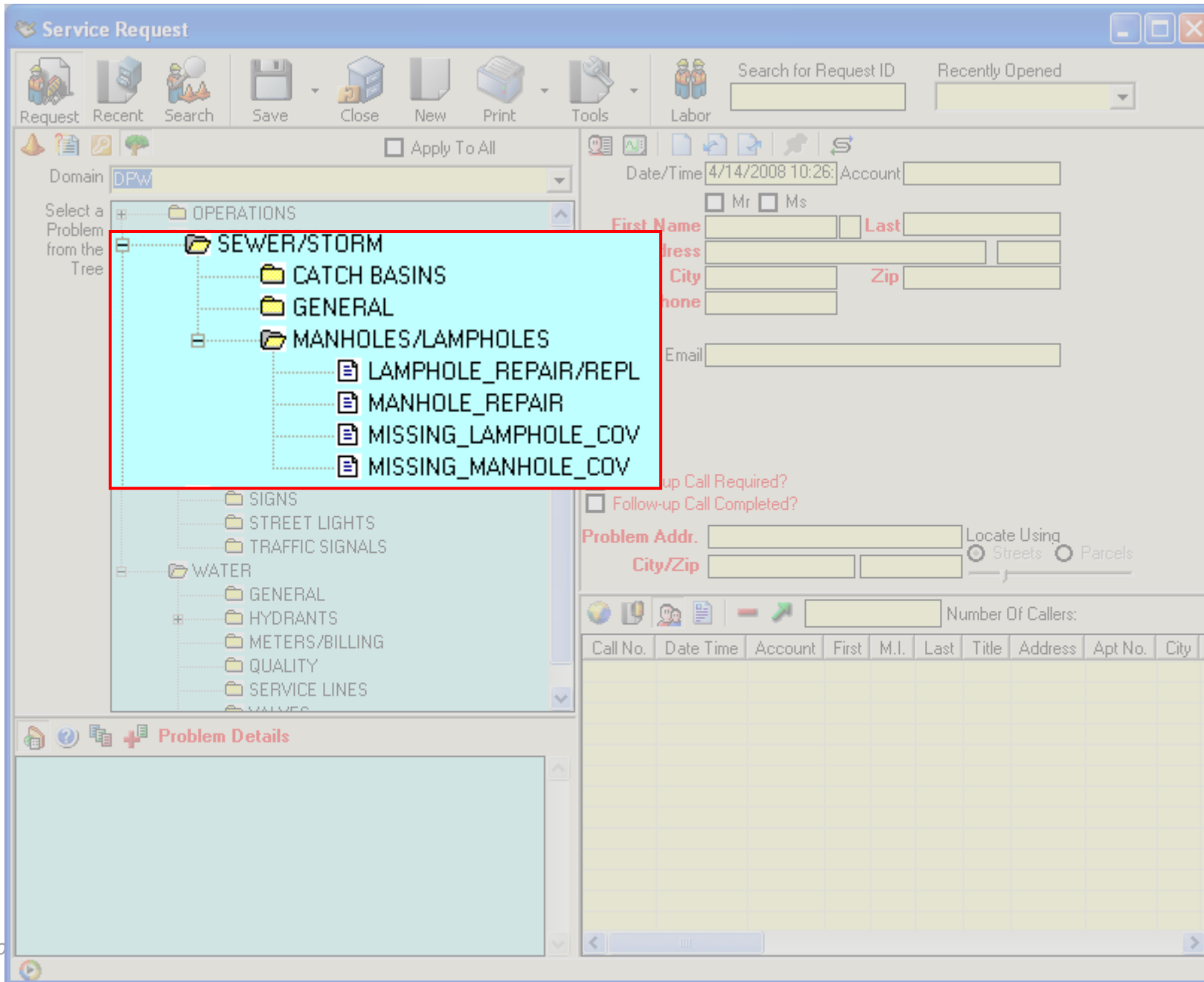
- City's Public Works Department
- 4 Divisions (230 employees)
 - Sewer
 - Water
 - Transportation
 - Operations

Service Request / Work Order System

“Computerized Maintenance Management System (CMMS)”







Service Request # 29438 MANHOLE_REPAIR / Manhole Needs Repair

Request Recent Search Save Close New Print Tools Labor

Search for Request ID: _____ Recently Opened: _____

Apply To All

Problem Type **MANHOLE_REPAIR**
 Description Manhole Needs Repair

ID/Status: 29438 OPEN

Priority/Division: 1 High SEWER

Initiated By: ADMIN, CITYWORKS 4/14/2008 11:03:01 AM

Submit To: _____ 4/14/2008 11:03:01 AM

Opened By: _____

Dispatch To: _____ 4/14/2008 11:02:52 AM

Opened By: _____

Pri Comp. Date: MM/DD/YYYY

Closed By: _____

Is the Investigation Complete?

Is This Incident an Emergency?

Is a Work Order Needed?

Cancel

Work Order: _____ [Open WO](#) [Attach To](#) [Create WO](#)

Work Order Description: _____

Project: _____ [Open](#) [Attach To](#)

Problem Details

Date/Time: 4/14/2008 11:03: Account: 014624

Mr Ms

First Name: BEN Last: SMITH

Address: 514 N WASHINGTON

City: WASHINGTON Zip: 19381-2134

Phone: _____

Email: _____

Follow-up Call Required?

Follow-up Call Completed?

Problem Addr.: 514 N WASHINGTON S. Locate Using: Streets Parcels

City/Zip: WASHINGTON 19381-2134

Number of Callers: 1

Call No.	Date Time	Account	First	M.I.	Last	Title	Address
29423	4/14/2008 11:03:01 AM	014624	BEN		SMITH		514 N WASHINGTON S.

Cityworks Anywhere

Scale 1" = 79' 1:946

Layers

- ALL_OPEN_SRS - REQ
 - REQCATEGORY
 - SAN
 - SEWER
 - STREETS
 - ST_CLEAN
 - TRANS
 - WATER
 - Water System
 - Fire Hydrant
 - Street Valve
 - Water Manhole
 - Pressurized Water Main
 - Water Service Lateral
 - Sewer System
 - Catch Basin
 - Sewer Manhole
 - Sewer Pipe
 - Sewer Lateral
 - Transportation
 - Street Light
 - Traffic Signal
 - Signal Control Cabinet
 - Parking Meter

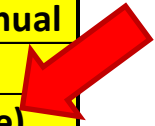
Map Data:

- SAN #27145 MISSED_RECYCLING
- SEWER #29438 MANHOLE_REPAIR
- SAN #2429 MISSED_RECYCLING
- ST_CLEAN #29019 SPECIAL_PICK_UP
- SAN #27122 MISSED_RECYCLING
- SAN #27225 OTHER_SANITATION
- SAN #23265 MISSED_RECYCLING
- SAN #23471 MISSED_RECYCLING
- SAN #23252 MISSED_RECYCLING
- SAN #23754 MISSED_RECYCLING

Streets: W 11TH ST, FOWLAND ST, INDUSTRY ST, W 10TH ST

Priorities for recovery example

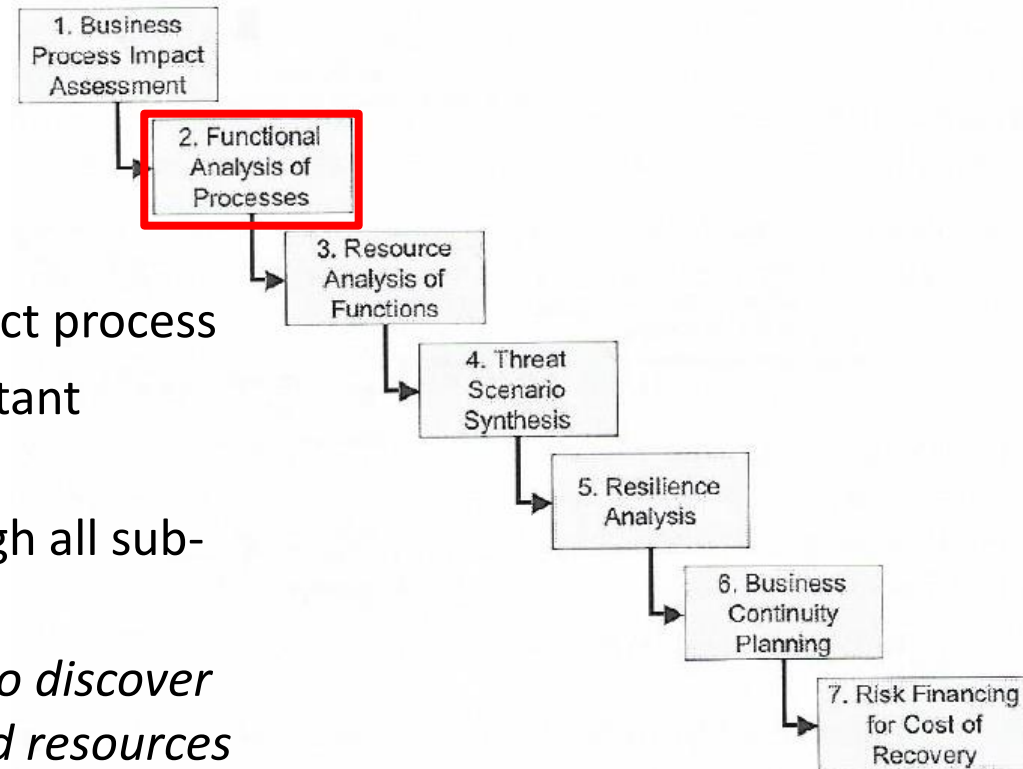
Public Works Dept Operations Division	Street Cleaning	Mow Grass
		Clean Lots
		Street Cleaning - Mechanical and Manual
		Snow Removal
		Debris Removal (Emergency Response)
		Special Pick Ups
		Leaf Removal
		Neighborhood Cleanup
	Public Property	Special Events
		Special Projects
		Building Repair
		Tree Lighting
		Electrical Repair
	Street	Potholes, Street Repair, and Resurfacing
		Special Event Blockade
	Sanitation	Catch Basin Repair
		Catch Basin Cleaning
		Garbage Collection



Auditing the Business Continuity Plan

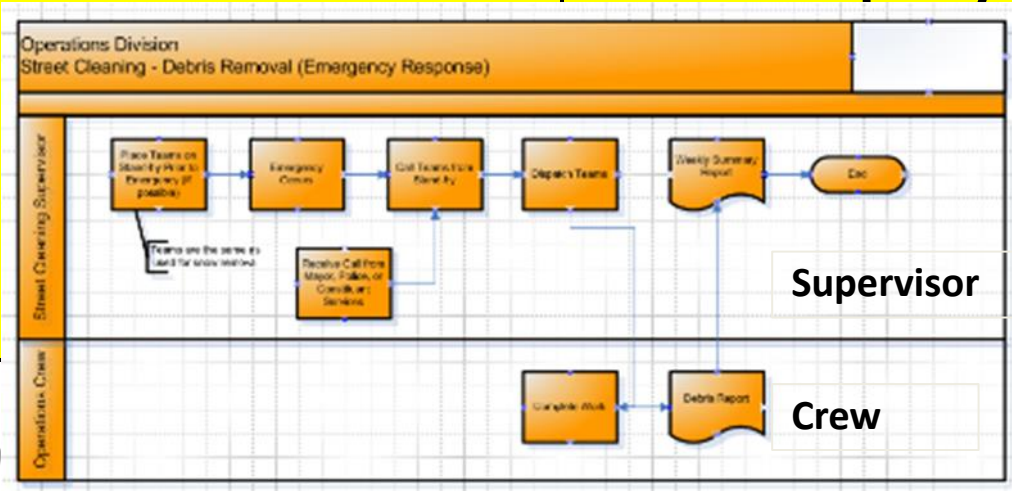
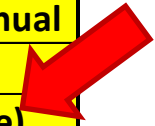
Step 2

- Select each high and moderate impact process
- Does documentation of these important business processes exist?
- Can your analysis follow trace through all sub-processes?
 - *Down to single functional steps to discover all information systems, data and resources needed to keep this high-impact or moderate-impact process in continuous operation?*



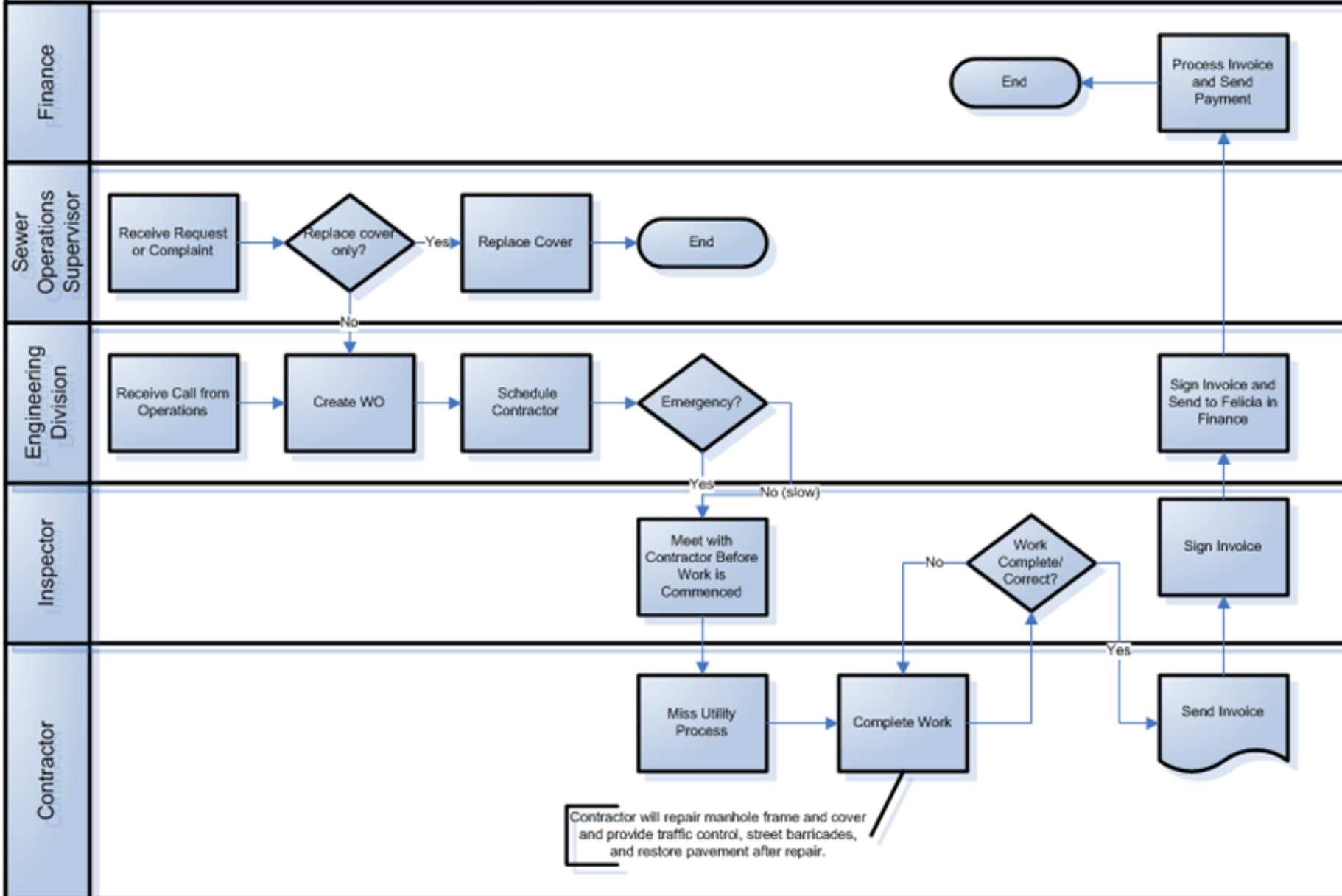
Priorities for recovery example

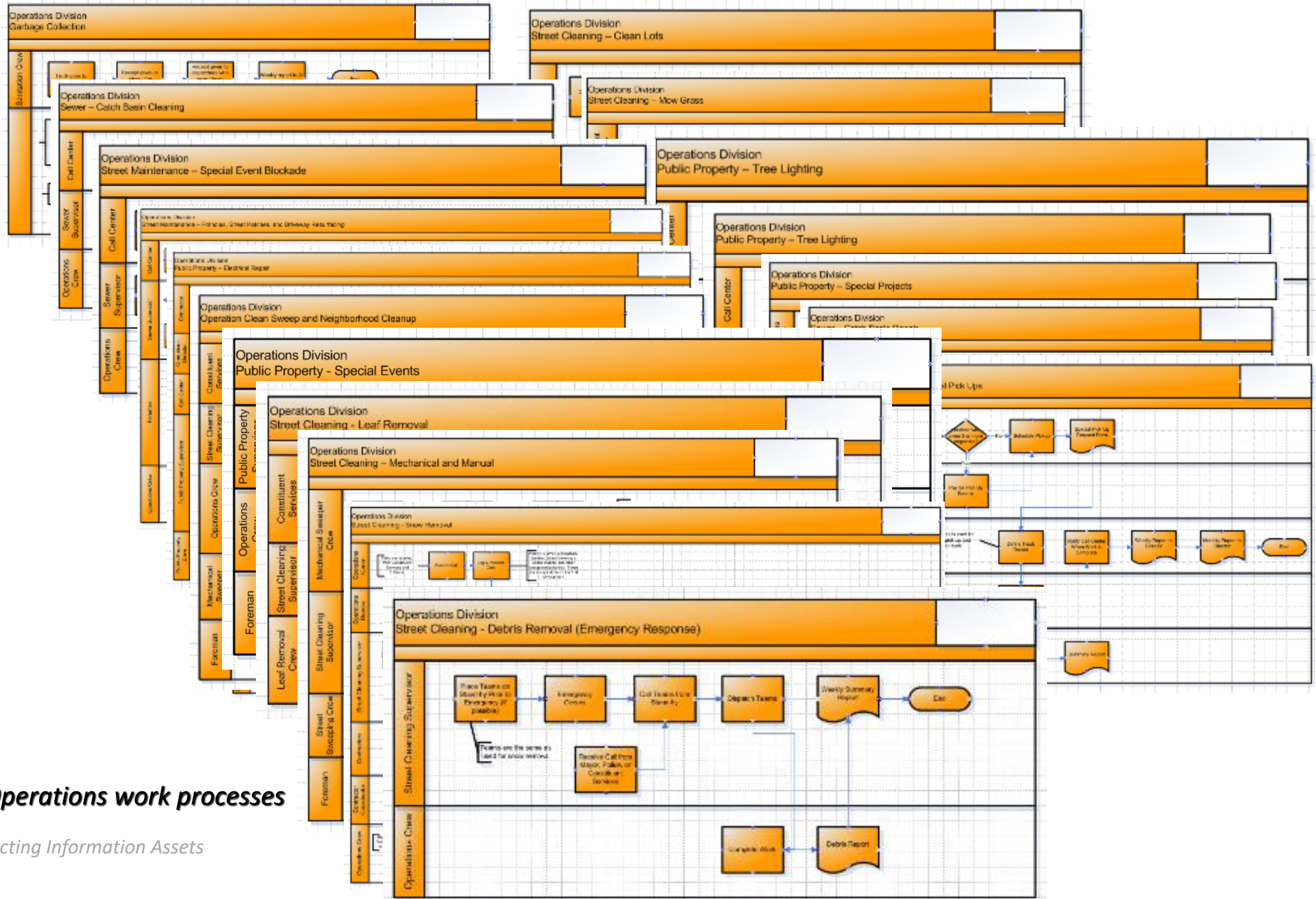
Public Works Dept Operations Division	Street Cleaning	Mow Grass
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		Leaf Removal
		Neighborhood Cleanup
	Public Property	Special Events
		Special Projects
		Building Repair
		Tree Lighting
		Electrical Repair
		Potholes, Street Repair, and Resurfacing
	Special Event Blockade	



Sewer Division
 Repair & Replace Manhole (Frame and Cover)

Contributor(s) to this Process:
 Michelle
 Edmond



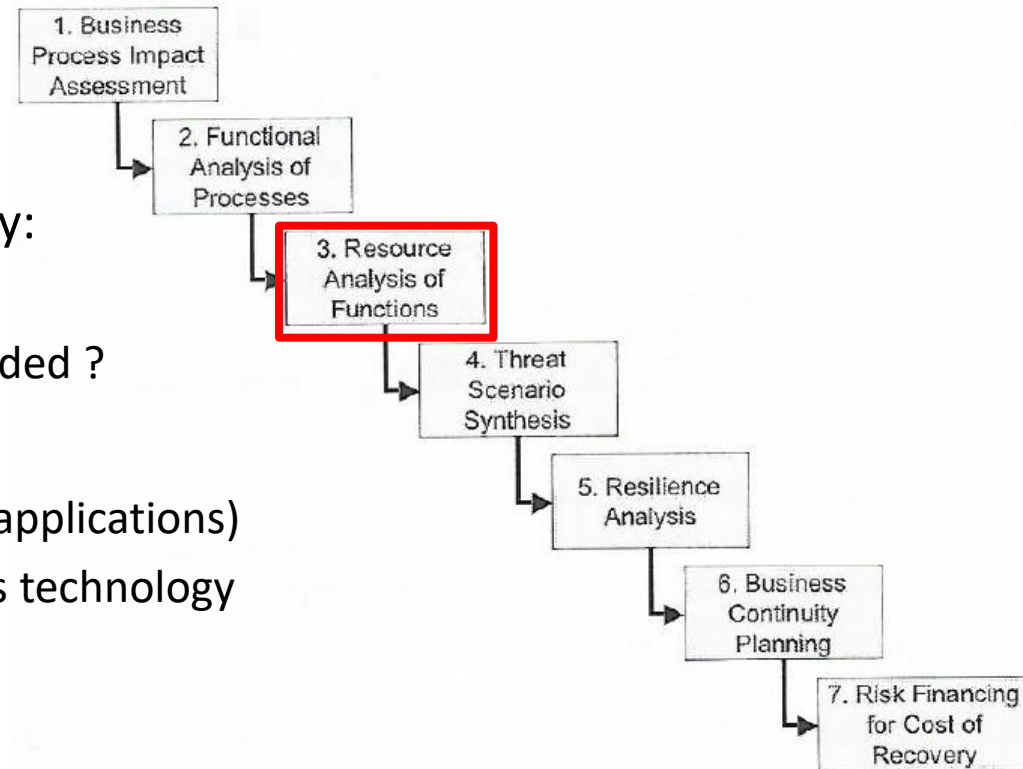


Operations work processes

Auditing the Business Continuity Plan

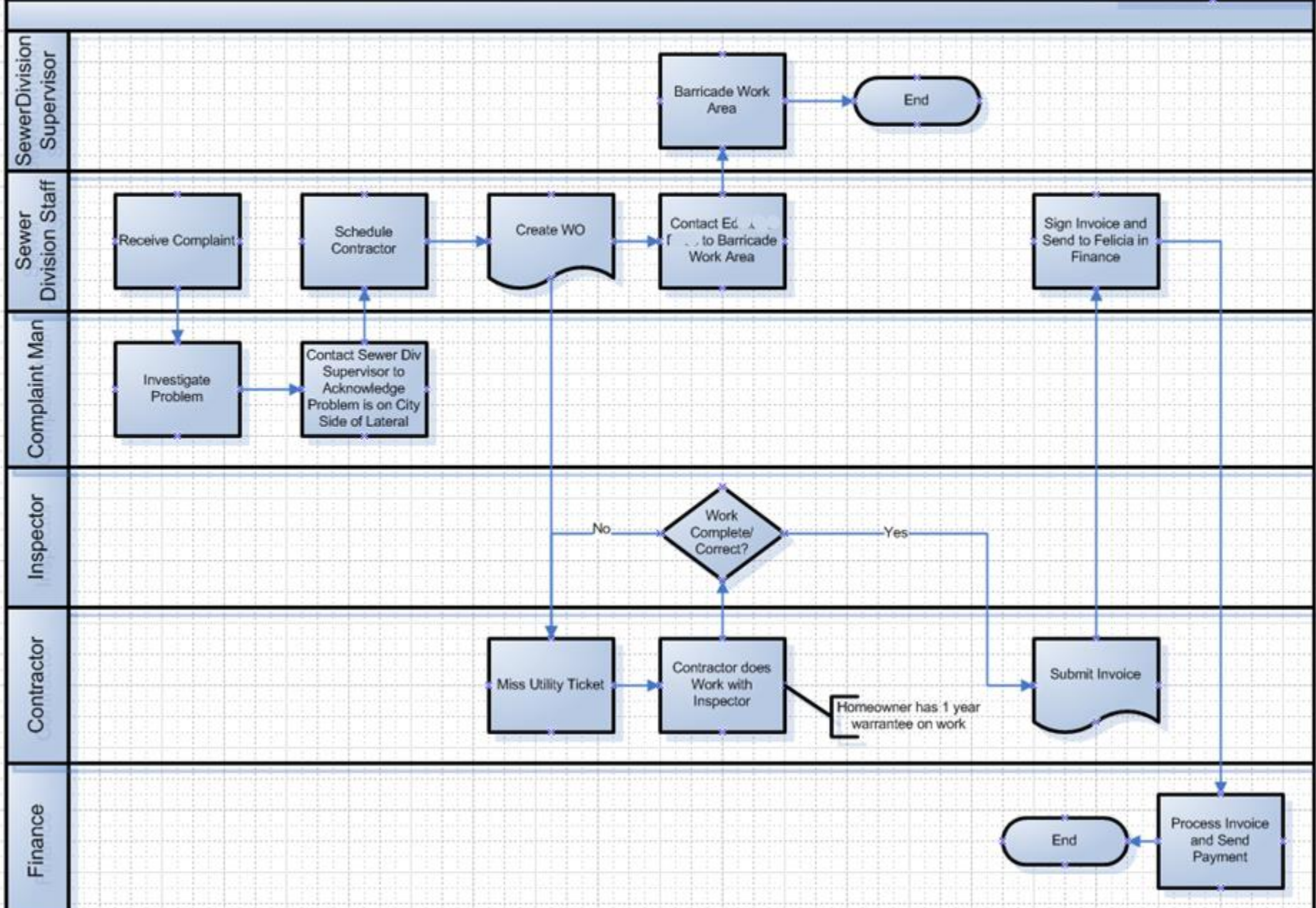
Step 3

- For each sub-process or function identified in Step 2, can you identify:
 - What resources are needed ?
 - How much of each resource is needed ?
 - People
 - Information systems (i.e. applications)
 - Data and communications technology
 - Other Equipment
 - ...



Sewer Division
 Laterals and Sewer Mains, Repair

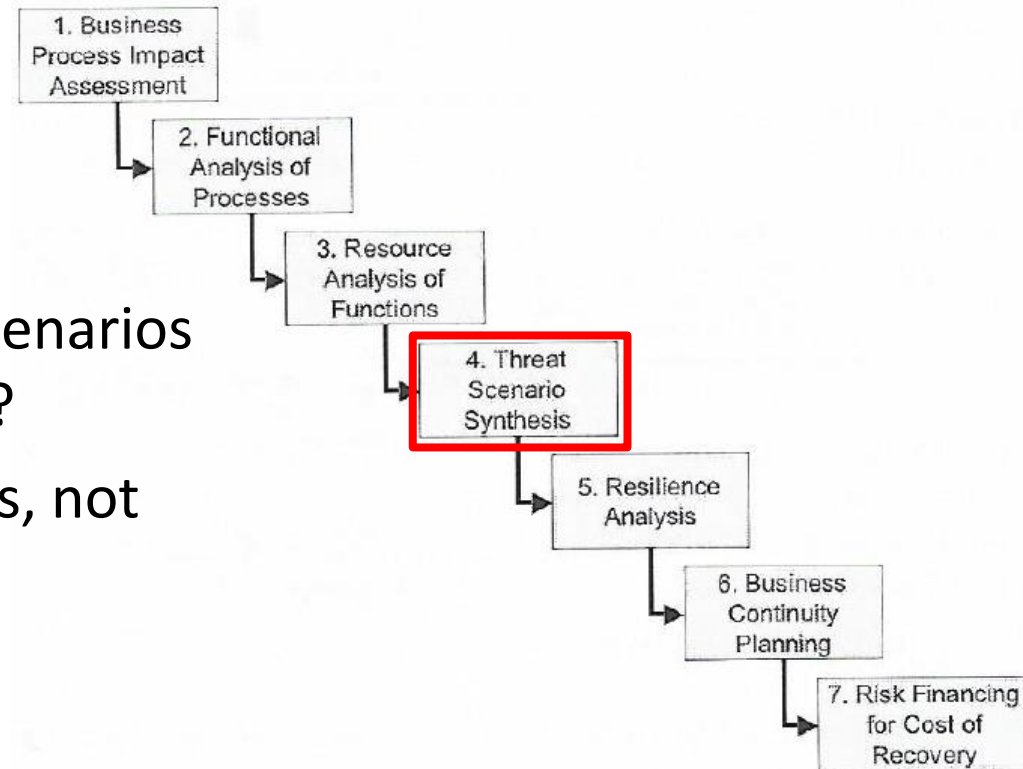
Have they documented the communications needed to coordinate resources?



Auditing the Business Continuity Plan

Step 4

- For each resource have they identified high-level threat scenarios that put that resource at risk?
- Have they focused on impacts, not causes?

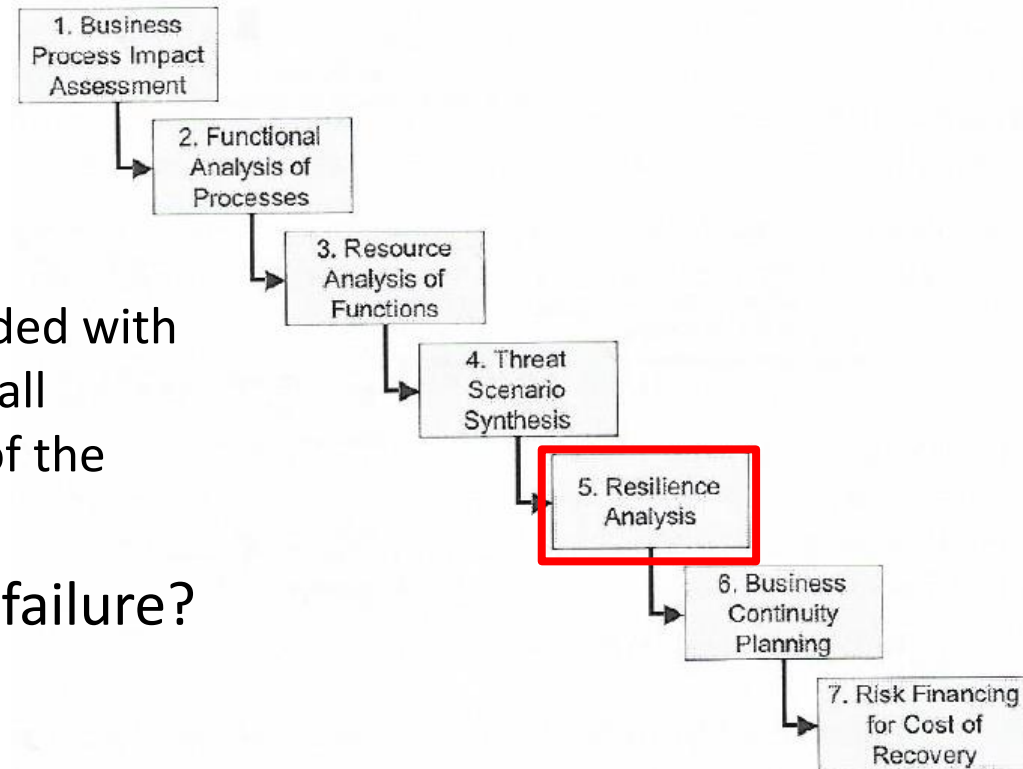


Sherwood, J., Clark, A. and Lynas D. (2005), Enterprise Security Architecture, CRC Press

Auditing the Business Continuity Plan

Step 5

- For each resource/scenario combination
 - Are the current resources provided with sufficient resilience for the overall business to withstand impacts of the scenario?
- Are there any single points of failure?

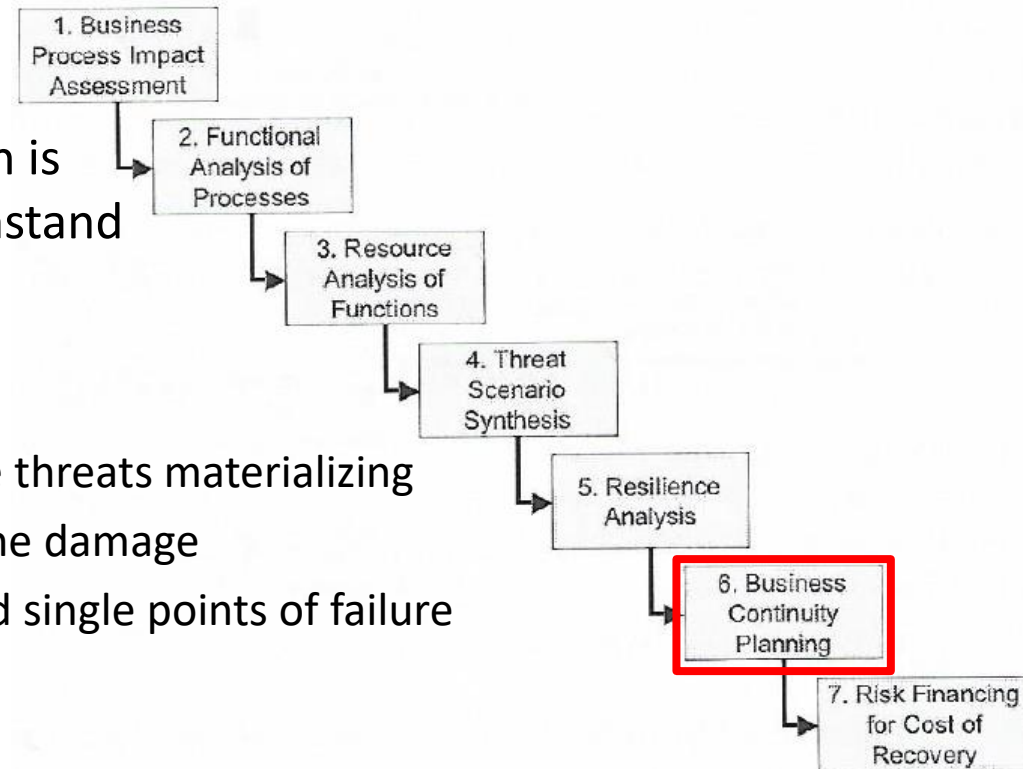


Sherwood, J., Clark, A. and Lynas D. (2005), Enterprise Security Architecture, CRC Press

Auditing the Business Continuity Plan

Step 6

- What additional resource protection is needed so overall business can withstand the threat scenarios?
- For example:
 - Preventive measures to avoid the threats materializing
 - Containment measures to limit the damage
 - Redundancy of resources to avoid single points of failure and to provide fallback capacity
 - Incident management plans
 - Recovery plans to resume business following an incident
 - Training and awareness



Sherwood, J., Clark, A. and Lynas D. (2005), Enterprise Security Architecture, CRC Press

CP-2	CONTINGENCY PLAN
	ASSESSMENT OBJECTIVE: <i>Determine if the organization:</i>

ASSESSMENT OBJECTIVE: <i>Determine if the organization:</i>			<i>in for the information system that:</i>
<i>develops and documents a contingency plan for the information system that:</i>			<i>and business functions and associated</i>
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CP-2(a)(2)	CP-2(a)(2)[1]	<i>provides recovery objectives;</i>	<i>oration priorities;</i>
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CP-2(a)(4)	<i>addresses maintaining essential missions and business functions despite an information system disruption, compromise, or failure;</i>		<i>mation system restoration without safeguards originally planned and</i>
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	CP-2(f)	CP-2(f)[1]	<i>defines key contingency personnel (identified by name and/or by role) and organizational elements to whom contingency plan changes are to be communicated;</i>

Business Impact Analysis (BIA) also answers

1. What are the work processes ?
2. How critical is each ?
3. What data, applications, and people are needed to run each critical process ?
4. What are the priorities for recovering information systems after disruption ?
5. For each critical IT resource, what is the :
 - **Recover time objective (RTO):**
Maximum acceptable downtime
 - **Recovery point objective (RPO):**
Maximum acceptable data loss (measured in time, but implies # of data records)
 - **Service delivery objective (SDO):**
Level of services to be reached during the alternative process mode until the normal situation is restored
 - **Maximum tolerable outage (MTO):**
Maximum time the organization can support processing in alternative mode

Auditing Recovery Plans

Have they documented:

1. Strategies, resources, timelines and dependencies?
2. Approaches to “re-initiate” crucial business functions and resume on-going operations?

Have the plans been reviewed and confirmed by function owners in the business as well as executives?

Contingency Planning (CP)

CNTL NO.	CONTROL NAME <i>Control Enhancement Name</i>	WITHDRAWN	ASSURANCE	CONTROL BASELINES		
				LOW	MOD	HIGH
CP-1	Contingency Planning Policy and Procedures		X	X	X	X
CP-2	Contingency Plan			X	X	X
CP-2(1)	CONTINGENCY PLAN COORDINATE WITH RELATED PLANS				X	X
CP-2(2)	CONTINGENCY PLAN CAPACITY PLANNING					X
CP-2(3)	CONTINGENCY PLAN RESUME ESSENTIAL MISSIONS / BUSINESS FUNCTIONS				X	X
CP-2(4)	CONTINGENCY PLAN RESUME ALL MISSIONS / BUSINESS FUNCTIONS					X
	AL MISSIONS / BUSINESS					X
	SSETS				X	X
			X	X	X	X
	ITS		X			X
			X	X	X	X
	TE WITH RELATED PLANS		X		X	X
	PROCESSING SITE		X			X
		X	Incorporated into CP-2.			
					X	X
	FROM PRIMARY SITE				X	X
	ME / POINT OBJECTIVES					X
					X	X
	ON FROM PRIMARY SITE				X	X
	LITY				X	X
	OF SERVICE				X	X
	ION FOR USE					X
	NT INFORMATION	X	Incorporated into CP-7.			
					X	X
	TY OF SERVICE				X	X
	POINTS OF FAILURE				X	X
	ATION OF PRIMARY /					X
	ER CONTINGENCY PLAN					X
				X	X	X
	OR RELIABILITY /				X	X
	TORATION USING					X
	E STORAGE FOR CRITICAL					X
	ION FROM UNAUTHORIZED	X	Incorporated into CP-9.			
	R TO ALTERNATE					X
	constitution			X	X	X
	CONSTITUTION	X	Incorporated into CP-4.			
	CONSTITUTION				X	X
	CONSTITUTION	X	Addressed by tailoring procedures.			
	COMPENSATING SECURITY CONTROLS					X
CP-10(4)	INFORMATION SYSTEM RECOVERY AND RECONSTITUTION RESTORE WITHIN TIME PERIOD					X
CP-10(5)	INFORMATION SYSTEM RECOVERY AND RECONSTITUTION FAILOVER CAPABILITY	X	Incorporated into SI-13.			

CONTROL NAME	BASELINES		
	LOW	MOD	HIGH
Contingency Planning Policy and Procedures	X	X	X
Contingency Plan	X	X	X
Contingency Training	X	X	X
Contingency Plan Testing	X	X	X
Alternative Storage Site		X	X
Alternative Processing Site		X	X
Telecommunications Services		X	X
Information System Backup	X	X	X
Information System Recovery and Reconstitution	X	X	X

What kind of offsite alternative recovery facility do they have ?

Hot site: A geographically remote facility, fully equipped and ready to power up at a moments notice

Warm site: Includes communications components but computers are not installed – will need to be delivered and setup

Cold site: Provides only the basic environment that can be outfitted with communication, utilities and computers

Site	Cost	Hardware Equipment	Telecommunications	Setup Time
Hot Site	High	Full	Full	Short
Warm Site	Medium	Partial	Full / Partial	Medium
Cold Site	Low	None	None	Long



What kind of offsite alternative recovery facility do they have ? (continued)

Mobile site: A packaged modular processing facility mounted on transportable vehicles and kept ready to be delivered and set up at a location specified on activation

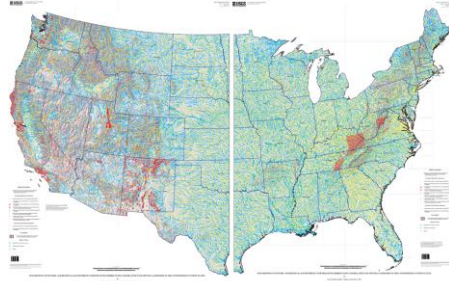
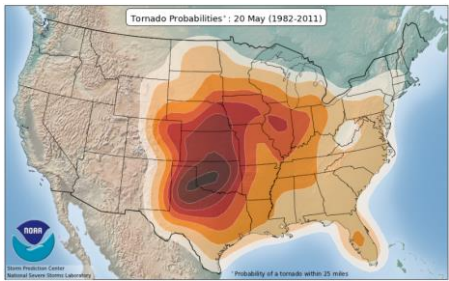
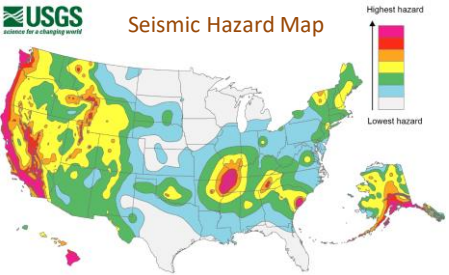
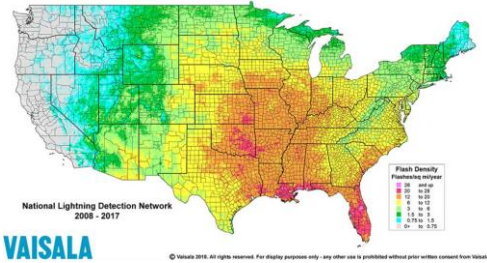
Shared site: Least expensive arrangement (“reciprocal agreements”) with compatible companies who agree to host each other's employees and business functions in the event of a disaster

- *Most risky alternative - few companies maintain extra capacity and equipment suitable to host another company's business processes*
- *Better than having no plan at all*

Location of Alternate Site

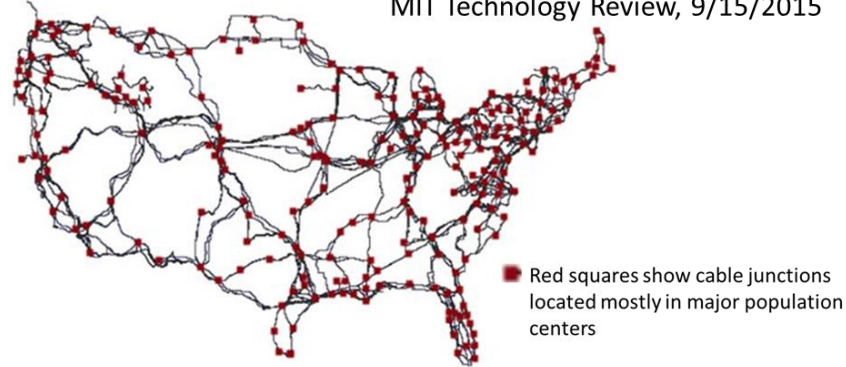
Disaster recovery site should be in a different geophysical area not susceptible to same disaster as the primary operations facility

Note: even the cloud is located somewhere...



With multiple providers of:

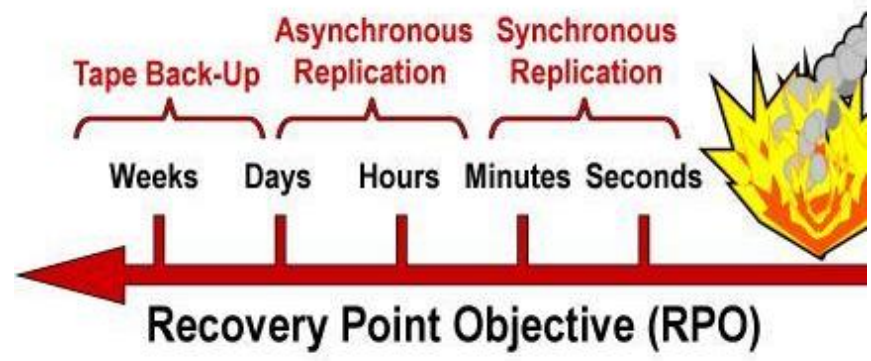
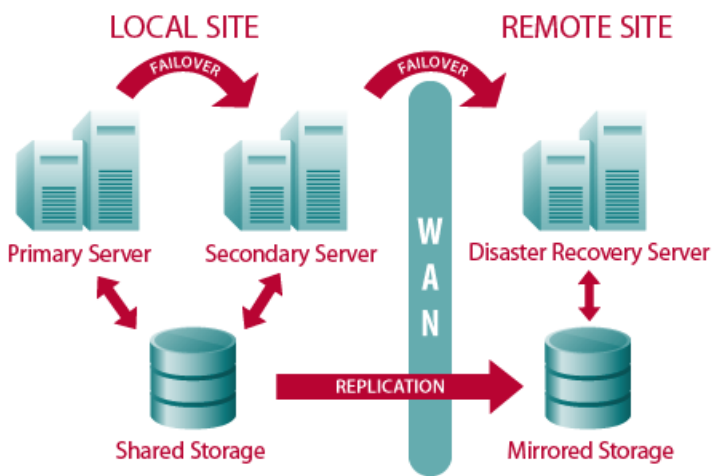
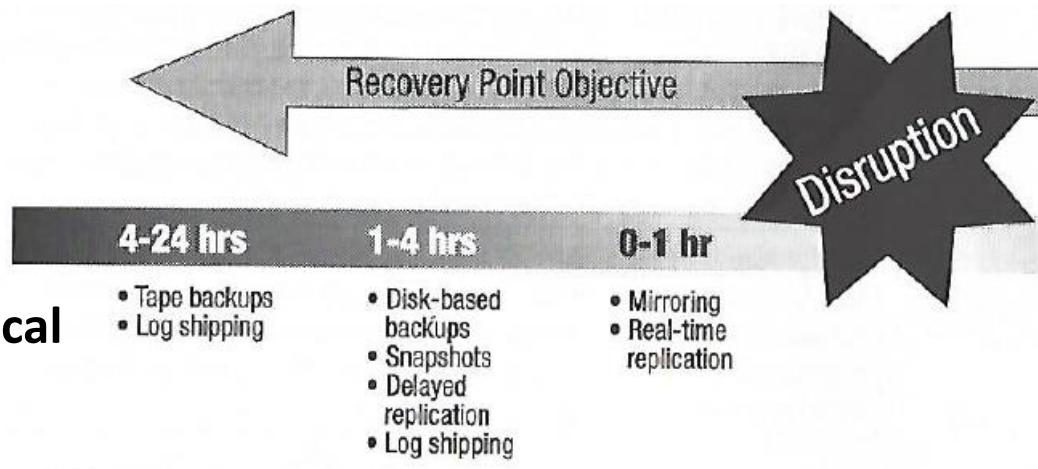
US Long-haul High-Speed Internet Fiber Network
MIT Technology Review, 9/15/2015



- Telecommunications
- Stable power supply
- Redundant utilities

Data backup systems and redundancies

- Database shadowing
- Electronic vaulting
- Remote journaling
- Storage area network and hierarchical storage management
- Shared storage
- RAID (Redundant Array of Independent Disks)
- Failover clustering

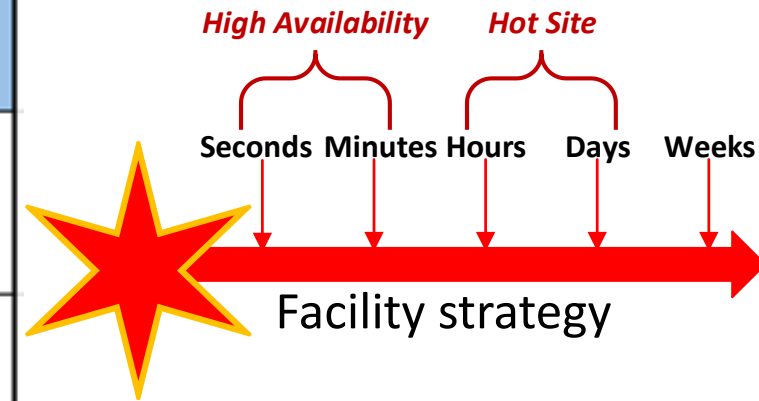


Recovery Site Options: Location strategy & Backup technology

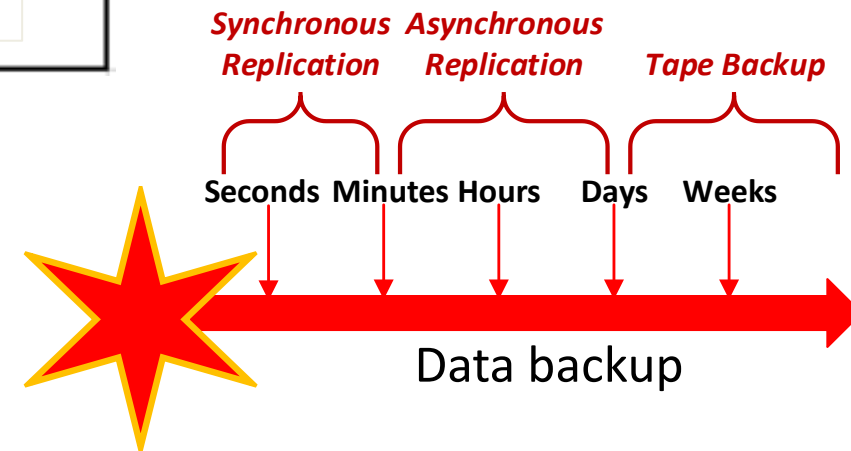
Information System Recovery Priority	Backup / Recovery Strategy
High priority	Backup: Mirrored systems and disc replication Strategy: Hot site \$\$\$
Moderate priority	Backup: Optical backup and WAN/VLAN replication Strategy: Warm or Cold site \$\$
Low priority	Backup: Tape backup Strategy: Cold site \$

[NIST SP 800-34 R1](#)
[Contingency Planning Guide for Federal Information Systems](#)

Recovery Time Objective



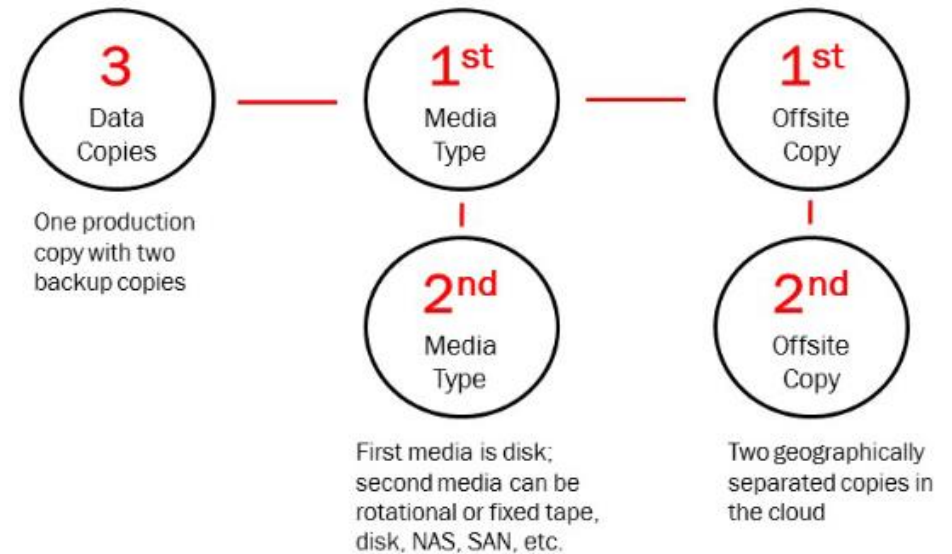
Recovery Point Objective



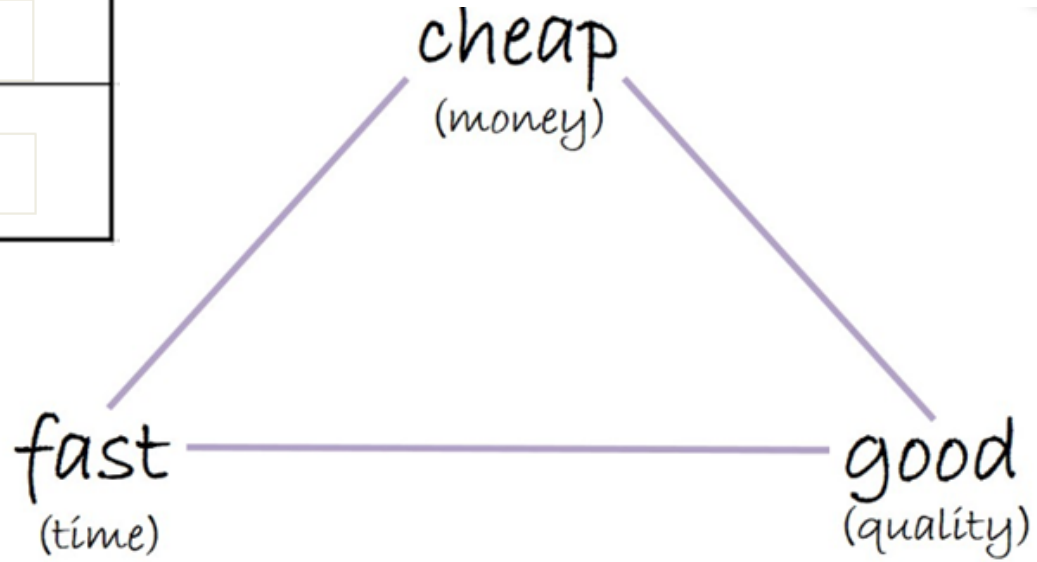
Backup Mitigation – Best Practice

Three-Two-One rule

- Make 3 copies of all mission critical software and corresponding data in 2 different formats (to run on Linux and Windows machines), with 1 copy stored off-site not connected to any network



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The Quality Triangle:

Pick Two

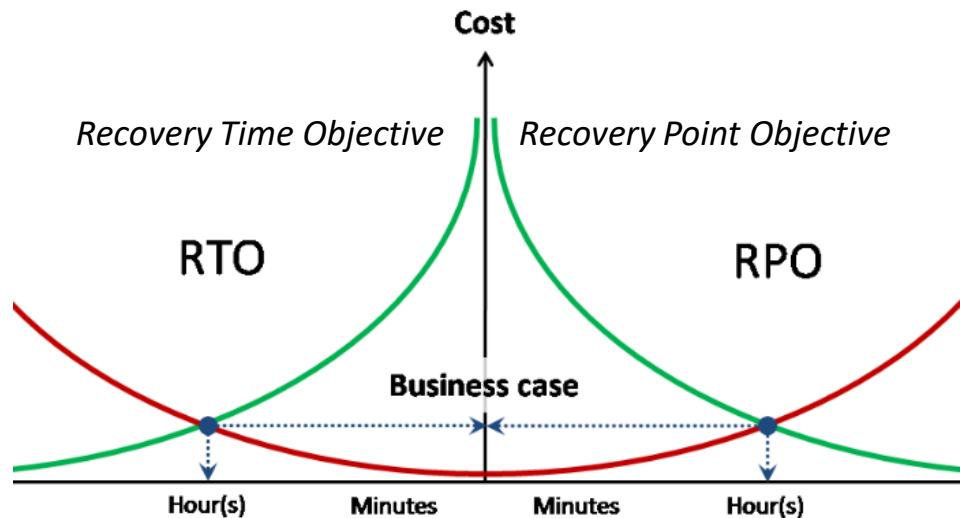
Disaster recovery time targets

Disaster recovery must be achieved within critical deadlines

- Need for careful analysis
 - Of business needs for recovery of services
 - Time-criticality of various information services

Speed of recovery must be traded off against cost

- If needed, non-stop 365 day by 24-hour service can be maintained, but it pushes the cost up very high
- Business needs and justifications must be detailed to plan disaster recovery
 - **Remember: The only goal is to create effective business continuity, whatever that needs to be**



Have they classified their application systems and scheduled their restoration?

Example Classification of Applications*

Classification		Description
1	Mission Critical	Mission Critical to accomplishing the mission of the organization Can be performed only by computers No alternative manual processing capability exists Must be restored within 36 hours
2	Critical	Critical in accomplishing the work of the organization Primarily performed by computers Can be performed manually for a limited time period Must be restored starting at 36 hours and within 5 days
3	Essential	Essential in completing the work of the organization Performed by computers Can be performed manually for an extended time period Can be restored as early as 5 days, however it can take longer

* From SANS

Have they properly planned the availability of replacement software?

- In addition to data...
 - Operating systems, programs and utilities used during regular business must also be backed up regularly to the offsite facility
- An application built for a one version of an operating system, will not run if different (wrong) version of the operating system is installed at the offsite facility
 - Data is often formatted to work in a particular version of a program,
 - If that version is not available at the backup facility, it is possible that the data will not be available for use in the time of need

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Have they planned for the availability of people after disaster?

- Attention focused on backing up and restoring data and technology, often overlooks people and necessary skillsets for continuing the operation of the enterprise
- Who is responsible for calling it a “disaster” to begin DRP implementation?
- Employees may not be available after a disaster:
 - Due to death, injury, or family responsibilities
 - Business continuity committee
 - Must identify the necessary skill set for each critical task
 - Need back-up solutions (e.g. using temp agencies or cross training individuals)

Do they have Recovery Teams?

After a disaster two teams may be assembled:

1. *Recovery team*

- Coordinates bringing up the alternative site
- To be sure everyone knows what to do, tests are conducted
 - Range from troubleshooting the plan by simply walking through documents detailing the sequence of events, rehearsing the plan up to the point of actual data or resource recovery at the main site

2. *Salvage team*

- Assesses damage and works to bring the businesses' primary facility back on-line

BCP & DRP Templates are Available

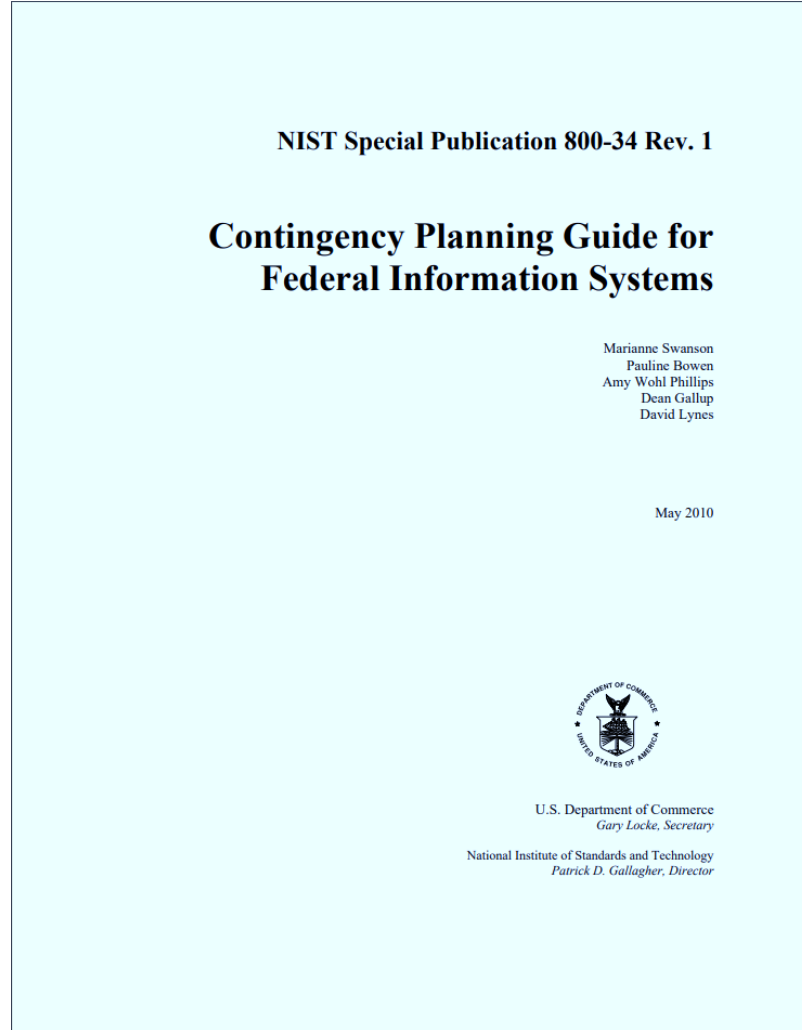


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Question

Is it practical to conduct a thorough test of a Business Continuity Plan (BCP)?

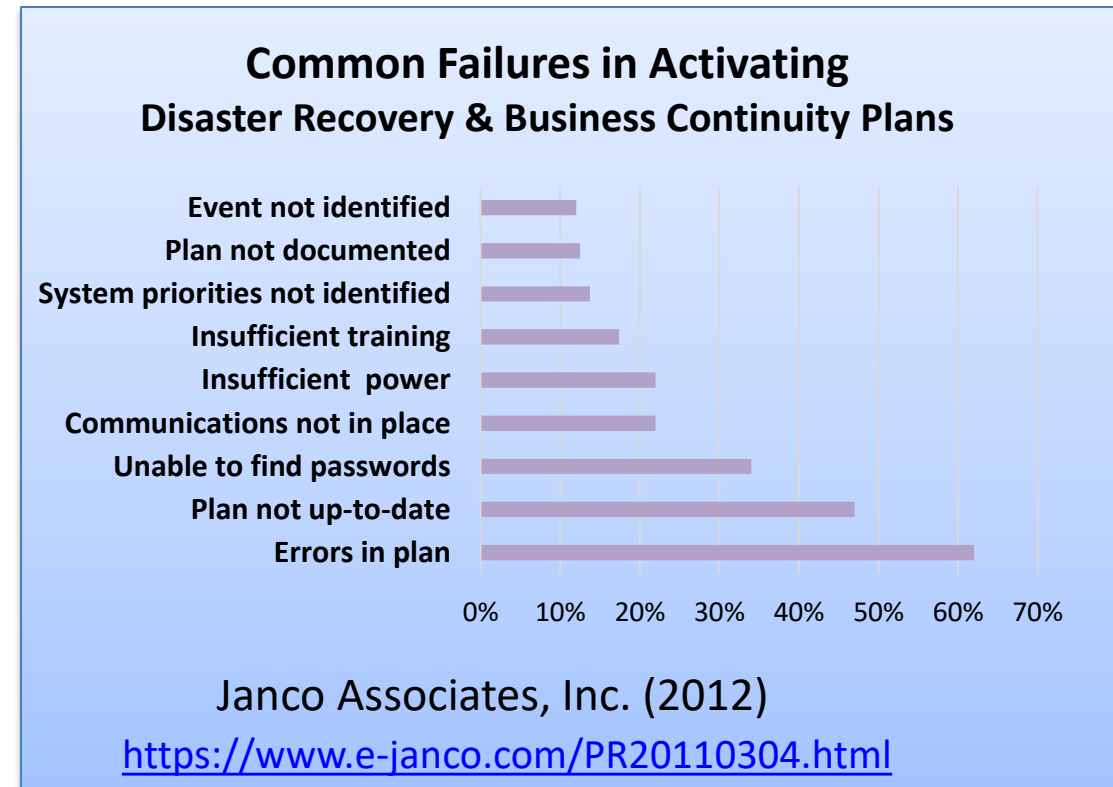
- *Why might it not be practical?*
- *If it is not practical, what alternative ways can you recommend for testing a BCP?*

Disaster Recovery and Business Continuity Plans must be practiced and tested

...to be sure the plan is good, everyone is prepared, and knows what to do

Can range from:

- *Checklist review*
- *Tabletop exercise*
- *Structured walk-through*
- *Dry-Run tests*



What DRP Tests have been conducted?

- **Checklist review**
 - Simplest, least labor-intensive form of testing
 - Each person has a checklist of responsibilities under the DRP
 - During testing: each person reviews his/her checklist
 - Can be done individually or as a group
- **Tabletop exercise**
 - Test facilitator describes a specific disaster scenario
 - DRP team members verbally walk through their responses to the scenario
 - Scenarios can be disseminated at the test or in advance



What DRP Tests have been conducted?

- **Structured walk-through**
 - More formal troubleshooting of the plan by simply walking through the documents detailing the sequence of events
- **Dry-Run tests**
 - Can be conducted on a function by function basis
 - Do not have test all functions for each cycle
 - Tests should involve actual interruptions and recoveries
 - Rehearsing the plan up to the point of actual data or resource recovery at the main site



Audit Focus

Areas for
IT Audit
evaluation:

**Figure 3—Possible Tests/Procedures
for Backup and Recovery**

Data	<ul style="list-style-type: none">• Review or observe backup procedures.• Review documentation of a successful restore (within the last year).• Verify restoration personally (when risk is high or restoration is an audit objective).
Site/computers/ OS	<ul style="list-style-type: none">• Review the provisions of the BCP/DRP.• Review a contract (hot site, cold site, mutual aid, etc.).• Verify the ability to restore these aspects.
Applications	<ul style="list-style-type: none">• Review the plan's provisions.• Review the critical applications list, including ranking.• Verify the ability to restore (personally, when risk is high or restoration is an audit objective).• Observe or inquire about the backups of application software and location.
Supplies/ documentation	<ul style="list-style-type: none">• Review the plan's provisions.• Observe or inquire about the provisions and location.
Recovery team	<ul style="list-style-type: none">• Review the plan's provisions.• Interview one or more members of the team, and ask about roles and responsibilities.• Gain assurance that there is provision for adequate personnel for a successful restoration.

Test Taking Tip

Don't Revise Your Answer

(without a very strong reason)

- Your first answer is probably the right one
- On an exam where there is no penalty for wrong answers, you are just using time that might have gone to getting another correct answer
- If you are having second thoughts, plan to come back to that question after you have completed the entire test

1. The BEST method for assessing the effectiveness of a business continuity plan is to review the:
 - a) Plans and compare them to appropriate standards
 - b) Results from previous tests
 - c) Emergency procedures and employee training
 - d) Offsite storage and environmental controls

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2. With respect to business continuity strategies, an information system (IS) auditor interviews key stakeholders in an organization to determine whether they understand their roles and responsibilities. The IS auditor is attempting to evaluate the:

- a) Clarity and simplicity of the business continuity plans
- b) Adequacy of the business continuity plans
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3. During the design of a business continuity plan, the business impact analysis (BIA) identifies critical processes and supporting applications. This will PRIMARILY influence the:
- a) Responsibility for maintaining the business continuity plan
 - b) Criteria for selecting a recovery site provider
 - c) Recovery strategy
 - d) Responsibilities of key personnel

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4. During a review of a business continuity plan, an IS auditor noticed that the point at which a situation is declared to be a crisis has not been defined. The MAJOR risk associated with this is that:
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 - b) Execution of the disaster recovery plan could be impacted
 - c) Notification of the media might not occur
 - d) Potential crisis recognition might be ineffective

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5. An organization has just completed their annual risk assessment. Regarding the business continuity plan, what should an IS auditor recommend as the next step for the organization?
- a) Review and evaluate the business continuity plan for adequacy
 - b) Perform a full simulation of the business continuity plan
 - c) Train and educate employees regarding the business continuity plan
 - d) Notify critical contacts in the business continuity plan

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6. Integrating business continuity planning (BCP) into an IS project aids in:
 - a) The retrofitting of the business continuity requirements
 - b) The development of a more comprehensive set of requirements
 - c) The development of a transaction flowchart
 - d) Ensuring the application meets the user's needs

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7. While observing a full simulation of the business continuity plan, an IS auditor notices that the notification systems within the organizational facilities could be severely impacted by infrastructural damage. The BEST recommendation the IS auditor can provide to the organization is to ensure:
- a) The salvage team is trained to use the notification system
 - b) The notification system provides for the recovery of the backup
 - c) Redundancies are built into the notification system
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8. The activation of an enterprise's business continuity plan should be based on predetermined criteria that address the:
 - a) Duration of the outage
 - b) Type of outage
 - c) Probability of the outage
 - d) Cause of the outage

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 - d) Cause of the outage

9. An organization has outsourced its wide area network (WAN) to a third-party service provider. Under these circumstances, which of the following is the PRIMARY task the IS auditor should perform during an audit of business continuity (BCP) and disaster recovery planning (DRP)?
- a) Review whether the service provider's BCP process is aligned with the organization's BCP and contractual obligations
 - b) Review whether the service level agreement (SLA) contains a penalty clause in case of failure to meet the level of service in case of a disaster
 - c) Review the methodology adopted by the organization in choosing the service provider
 - d) Review the accreditation of the third-party service provider's staff
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10. An IS auditor can verify that an organization's business continuity plan (BCP) is effective by reviewing the:
- a) Alignment of the BCP with industry best practices
 - b) Results of business continuity tests performed by IT and end-user personnel
 - c) Off-site facility, its contents, security and environmental controls.
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Agenda

- ✓ In The News
- ✓ Business Continuity and Disaster Recovery Planning
- ✓ Test Taking Tip
- ✓ Quiz

Protecting Information Assets

- Unit# 9 -

Business Continuity and Disaster Recovery Planning