California Sanitation Risk Management Authority

Wastewater Treatment Plant Contingency Planning

CSRMA and the SWRCB

- History
- Activities
- Goals
  - Reduce frequency and severity of overflows and backups

CSRMA is a risk mgt organization...
This often means pushing our members to go beyond regulatory compliance
As We Review The Material, Remember:

NOTE: Compliance is **NOT** the Gold Standard

It Is The Minimum Standard.

**ANY** Organization’s goal should be **RISK MANAGEMENT**

What is Risk Management?

- Risk Management is the process of looking into the future (from 5 seconds to 5 decades) and looking for things that can go wrong and then doing something now to prevent it from going wrong

- **RPM**
  - Recognize
    - I.e. risk assessment
  - Prioritize
    - In terms of frequency and severity
  - Mobilize
    - Act on the identified risks
**Keys to a Successful Risk Mgt Program**

These Activities/Metrics Allow You To Change Course and Make Adjustments BEFORE Something Bad Happens

<table>
<thead>
<tr>
<th>Leading Indicators</th>
<th>Lagging Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Elements</td>
<td>Measures Results</td>
</tr>
<tr>
<td>Physical conditions</td>
<td>Actions</td>
</tr>
<tr>
<td>- Inspections</td>
<td>- Goals Being Met?</td>
</tr>
<tr>
<td>- Audits</td>
<td>- SSOs</td>
</tr>
<tr>
<td>- Risk assessments</td>
<td>- Asset Failures</td>
</tr>
<tr>
<td>- Prevention &amp; control</td>
<td></td>
</tr>
</tbody>
</table>

**Is not having a Contingency Plan for a pump station a Leading Indicator that a failure may be worse than it had to be?**

---

**Risk Management is the Difference Between Being Lucky and Being Good!**

Things do go wrong...but the impacts are contained through pre-planned responses (*i.e. CONTINENCY PLANNING*)
Do Treatment Plants Ever Fail?

- Power failures?
- Hydraulic Overload?
- Disinfection failures?
- Process Failures or Upsets?

Does Anyone Ever Notice When a Treatment Plant Has “Problems?”

Marin Sewage Spill Prompts State Investigation

MILL VALLEY, Calif. (KCBS) — The California Environmental Protection Agency has begun an independent review of the Regional Water Quality Control Board following the sewage spill into Richardson Bay.

An investigation into last week’s 2.4 million gallon sewage spill was done by the county seven days earlier.

State water officials say last week’s spill of partially treated sewage was preceded by 2.5 million gallons of virtually raw sewage during a storm on Jan. 20.

The Sewage Agency of Southern Marin reported the first spill to the state Regional Water Quality Control Board, which oversees the water treatment plant in Mill Valley.

But the Marin agency did not report how much sewage was released and used an incorrect date.

The regional board is investigating both spills, but the agency will also be investigated.

20: water board officials said.
20: “Instead of stopping a 7, someone typed in a 20.” - Tang said.

EPA chief seeks probe of Marin sewage spills

The state’s top environmental official has called for an independent investigation of the agency that regulates Bay Area water pollution after the pirated response by a Marin County official to two spills that discharged more than 4 million gallons of raw sewage into the bay last week.

In a letter, Linda Adams, director of the state Environmental Protection Agency, called for an independent investigation of the agency that regulates Bay Area water pollution after the pirated response by a Marin County official to two spills that discharged more than 4 million gallons of raw sewage into the bay last week.

In a letter, Linda Adams, director of the state Environmental Protection Agency, called for an independent investigation of the agency that regulates Bay Area water pollution after the pirated response by a Marin County official to two spills that discharged more than 4 million gallons of raw sewage into the bay last week.

In a letter, Linda Adams, director of the state Environmental Protection Agency, called for an independent investigation of the agency that regulates Bay Area water pollution after the pirated response by a Marin County official to two spills that discharged more than 4 million gallons of raw sewage into the bay last week.
Regulatory Liability

Pacifica fined $2.3 million for illegal sewage discharges into ocean

By Julia Scott

PACIFICA — The San Francisco Bay Regional Water Quality Control Board slapped a $2.3 million fine on the city of Pacifica this week for illegal sewage discharges into the Pacific Ocean during a rainstorm in January 2008.

The city discharged 5.9 million gallons of partially treated sewage mixed with rain water on Jan. 25 and 26, 2008, when a powerful storm overwhelmed its wastewater treatment plant, preventing the plant from processing sewage to the level required by law. The same storm also overwhelmed the city's sewage collection system, pushing 100,000 gallons of raw human waste out of manholes and into the streets, creeks and the ocean.

City officials are objecting to the size of the fine, which they say is unwarranted because all the sewage that went through the Colma Creek Water Recycling Plant was disinfected before it was released into the ocean, although it did not pass through a final sand filter to remove tiny particles of fecal matter, kitchen grease and other refuse.

Regulatory Liability

Sewage spill: Who's to blame?
South County sanitation district faces a $1.3 million fine

BY KATHY JOHNSTON

Raw sewage pouring into the underground pump room at the South County sewage plant was already four feet deep and rising—but plant operator Jeff Appleton waded into the murky effluent to try to wrestle open a crucial discharge valve during a plant emergency two winters ago.

In dramatic testimony at a lengthy hearing Sept. 7, Appleton described the harrowing series of events that led to a major sewage spill from the Oceanos treatment plant in December 2010, when hundreds of gallons of raw sewage flowed up into bathtubs and toilets at nearby homes, and into a creek, a lagoon, and the ocean.

A surprise witness called by prosecutors from the Office of Enforcement at the State Water Resources Control Board, Appleton had been subpoenaed at the last minute to testify at the hearing before members of the Central Coast Regional Water Quality Control Board.

As he described each problem the sewage plant faced on that rainy Sunday—an electrical failure due to old and inadequate wiring, a faulty backup pump, leaking influent gates, improper grading that had created ponding on top of an electrical box, a closed discharge valve—he repeatedly said he had previously warned John Wallace, district administrator for the South SLO County Sanitation District, about the need to address the various issues.
Regulatory Liability

State argues for fine against South County sewage district over Oceano spill

Sewage treatment plant argues against a proposed $1.3 million fine from the state water board for December 2010 incident

UPDATE 1:20 a.m. Saturday: The Central Coast Regional Water Quality Control Board delayed a decision on whether to uphold a more than $1.3 million fine against a South County sewage treatment plant for a spill in Oceano in December 2010.

The board will meet in closed session on Oct. 3 in San Luis Obispo to deliberate.

More Case Details

• Surcharged collection system:
  – Spilling upstream from over twenty (20) “observed” locations by discharger in flooding conditions.
  – Due to failure, 11 sewer backups into residences were discovered as part of the State’s investigation.
**Regulatory Liability**

In response, Julie Macedo, senior staff counsel for the state water board’s Office of Enforcement, argued the sanitation district had years to properly budget funds for projects to address problems.

“Delayed maintenance issues are not acts of God,” Macedo said. “There were several unresolved issues that were known and should have been repaired prior to the spill.”

...penalties must be calculated to eliminate the **economic advantage** achieved through noncompliance with water quality laws...

---

**SanLuisObispo.com**

**THE TRIBUNE**

You are here: Root Published: Thursday, Aug. 23, 2012

**Criminal charges possible for 2010 Oceano sewage spill**

Sanitation district may have fraudulently underreported volume of 2010 sewage incident

By Cynthia Lambert | clambert@thetribunenews.com

Shortly after the State Water Resources Control Board opened an investigation into a December 2010 sewage spill in Oceano, state officials determined they might have more than a civil case on their hands.

About a month after starting its work, the water board’s Office of Enforcement received information that led officials to believe the South San Luis Obispo County Sanitation District may have fraudulently misreported and underreported the volume of the spill.
Civil Liability

San Francisco Bay's pollution watchdog since 1989

Our Work  News  Take Action  About  Donate

Sick of Sewage

Sick of Sewage Campaign

After more than a decade of working to stop sewage spills to the Bay, San Francisco Baykeeper launched a Sick of Sewage Initiative to rein in the Bay’s sewage spill problem. The Sick of Sewage Initiative tackles both immediate sewage spill incidents and the systemic problem of inadequate sewage infrastructure in Bay Area communities, through investigative water quality monitoring, legal action, advocacy for new laws and public education. Baykeeper is holding the worst polluters accountable and advocating for a region-wide upgrade to sewer systems in the Bay Area to keep sewage out of our homes, streets, creeks and the Bay.

Legal Action: Enforcing the Clean Water Act

San Francisco Baykeeper uses the citizen suit provision of the Clean Water Act to hold polluters accountable for illegal sewage spills. We have previously leveraged sewage infrastructure upgrades in the cities of Vallejo, Richmond, Burlingame, Burlingame Hills and Hillsborough. We currently have a series of active lawsuits in San Mateo County and in the East Bay. Read more about our successful settlements to prevent sewage spills to the Bay.
CITIZEN SUIT ENFORCEMENT UNDER THE FEDERAL CLEAN WATER ACT
A Snapshot of the California Experience
Based on Notices of Intent to Sue
March 2009 through June 2010

May 2011

The greatest numbers of citizen notices were filed in the jurisdictions of the Central Valley Regional Water Board (Region 5) and the San Francisco Bay Regional Water Board (Region 2). Citizen actions were not initiated in four regions during the reporting period: the Central Coast Regional Water Board (Region 3), the Lahontan Regional Water Board (Region 9), the Colorado River Regional Water Board (Region 7), and the San Diego Regional Water Board (Region 6).

Who are the Organizations Filing These Notices?
Orange County Coastkeeper
Northern California River Watch
California Sportfishing Protection Alliance
San Francisco Baykeeper
Global Community Monitor
Santa Monica Baykeeper
Communities for a Better Environment
Ecological Rights Foundation
Environmental Water Watch
Our Children's Earth Foundation
TEAM Enterprises
Wild Equity Institute
Wishkoi Foundation
Ventura Coastkeeper
John and Pauline Longes

Which Firms Represent these Citizen Organizations?
Lawyers for Clean Water, Inc.
The Law Office of Jack Silver
The Law Offices of Andrew Packard
Environmental Advocates
Lozeau Drury LLP
Greben & Associates
Kershaw, Cutter & Ratinoff, LLP
Klamath Environmental Law Center
Law Office of Suma Peesapati

Note from SWRCB Office of Enforcement:
“number of organizations/cases are expanding and the SWRCB is tracking these cases on a statewide basis “
What To Do?

EPA Guidelines

Contingency Plans

—a guide for wastewater producers and wastewater treatment plant operators

Updated May 2009

EPA 842K.09. This guideline has been provided to help licensees specifically realize the large-scale operations draft Contingency Plans that meet the standard acceptable to the Environmental Protection Authority.

Introduction

Wastewater is hazardous to the environment, especially to people, plants and groundwater. Therefore, it needs to be carefully controlled, stored and distributed by industrial or agricultural wastewater producers and wastewater treatment plant operators. Contingency Plans (CP) are an important tool for responsible wastewater management.

A CP is defined as a plan of action to be taken in the event of foreseeable emergencies that may involve the risk of serious or material environmental harm.

This plan helps prevent and manage incidents that could result in environmental impacts, such as:

- environmental harm, eg, oil contamination, surface or groundwater pollution
- environmental nuisance, eg, excessive odour, noise, dust or smoke
- unacceptable risk to public health.

CPs provide clear guidance during situations (such as accidental spills, equipment or plant failure) when things are out of control and often not a good time for decision-making.

The CP may also be aligned with the company's occupational health and safety policies or Emergency Response Procedures.
A CP is defined as a plan of action to be taken in the event of foreseeable emergencies that may involve the risk of serious or material environmental harm.

CPs help prevent and manage incidents that could result in environmental impacts, such as:

- **Environmental harm**, eg soil contamination, surface or groundwater pollution
- **Environmental nuisance**, eg excessive odor, noise, dust or smoke
- **Unacceptable risks to public health.**
Typically 3 ways in which most CPs are initiated by the EPA:

1. **Required under Section 53 of the EP Act**
   - Activities performed in a sensitive receiving environment such as designated water protection or marine protected area

2. **A licensee decides it is needed to meet their general environmental duty**

3. **EPA may require a CP for a specific identified risk**

---

### 1. Required by EP Act

- **Path 1:** Environmental Audit
- **Path 2:** ID risks from available information or common knowledge
- **Path 3:** EPA specified risk

### 2. Licensee decision

- Large-scale Ops or complex Environmental issues
- ID Hazards using Aspects & Impacts (A/I) Register
- Risk Analysis to priority issues

### 3. EPA Specified Risk

- EPA recognized significant risk that needs to be addressed
- EPA specified risk

- Develop Actions for Risk Treatment
- Draft the CP
- Management Endorsement
- Training, Implementation, Review
1st Step: Identifying Hazards
Using the Aspects & Impacts Worksheet

<table>
<thead>
<tr>
<th>Potential Aspects (Malfunctions)</th>
<th>Conditions</th>
<th>Consequences to the WWT or Environment (Impact)</th>
<th>Relative Risk</th>
<th>Process Contingency Plan Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Both gen’ s Partial Failure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Failure (see Power)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating at 0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet Weather</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design PF (20 MGD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment at 100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet Weather</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design PF (20 MGD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment at 100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet Weather</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 year storms event (25 MGD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CMT Removal (1 unit)**

- 1. Bring in portable backup generators
- 2. See Power Failure Contingency SOP

Partial Equipment Failure: One SC Generator non-operational due to:
1. Major Earthquake
2. Fire or explosion
3. Substage
No backup generators.
Plant will be 0% operational.
F5
1. Bring in portable backup generators
2. See Power Failure Contingency SOP

Total Equipment Failure: One SC Generator non-operational due to:
1. Major Earthquake
2. Fire or explosion
3. Substage
No backup generators.
Plant will be 0% operational.
F5
1. Bring in portable backup generators
2. See Power Failure Contingency SOP

Partial Failure: One SC Generator non-operational due to:
1. Repairs
2. Moderate Earthquake
3. Fire or explosion
Power failure less than 44 hours. One generator will have the total 3000 gallons of fuel available.
All treatment processes will be functional except for the ultraviolet disinfection which will not be able to function at 100%. Partial disinfection will be achieved.
F4
1. Bring in portable backup generators
2. See Power Failure Contingency SOP
3. See Power Failure Contingency SOP

Critical Failure: 2 backup generators
Power failure more than 24 hours. Both generators will have the total 3000 gallons of fuel available.
Will not be able to power the plant after 22 hours unless backup fuel is brought in.
F5
1. Bring in portable backup generators
2. See Power Failure Contingency SOP
3. See Power Failure Contingency SOP

Both gen’ s Power Failure
Power failure more than 24 hours. Both generators will have the total 3000 gallons of fuel available.
No backup generators supply 100% of the plant power needs up to 22 hours if the 3000 gallon diesel fuel tank is full. Additionally, all PLC’s have backup power supply units.
No impact
None necessary

- 1. Bring in portable backup generators
- 2. See Power Failure Contingency SOP
- 3. See Power Failure Contingency SOP

Potential Aspects (Malfunctions)
- Failure: One SC Generator non-operational due to:
  1. Repairs
  2. Moderate Earthquake
  3. Fire or explosion
- Power Failure: one SC Generator non-operational due to:
  1. Repairs
  2. Moderate Earthquake
  3. Fire or explosion
- Critical Failure: 2 backup generators
- Both gen’ s Power Failure
- Both gen’ s Partial Failure
- Partial Equipment Failure: One SC Generator non-operational due to:
  1. Repairs
  2. Moderate Earthquake
  3. Fire or explosion

Consequences to the WWT or Environment (Impact)
- Functional for 44 hours except for the ultraviolet disinfection which will not be able to function at 100%
- After 44 hours, there will be no treatment unless backup fuel is brought in.
- All treatment processes will be functional except for the ultraviolet disinfection which will not be able to function at 100%. Partial disinfection will be achieved.
- Critical removal system has proven to handle flows up to 25 MGD for short durations. Extended durations may cause flow to back up in the sewage systems.
- Backup fuel will be purchased from a local supplier after 8 hours (1000 gallon capacity)
- Backup fuel is not readily available, non-emergency equipment will be shut down.
- Replace planning to replace diesel tank with 5000 gallon tank

Relative Risk
- 1 (Low)
- 2 (Moderate)
- 3 (High)
- 4 (Very High)
- 5 (Highest)

Acknowledgments
This is an example of identifying hazards and using a contingency planning worksheet. The worksheet includes different scenarios and consequences, along with corresponding relative risks and process contingency plan key points.
**EPA “Environmental Harm” Risk Matrix**

- **Consequences**
  - Levels 1 – 5
  - Environmental Harm comes from EP Act

- **Likelihood**

- **Value from:**
  - G-1 (lowest risk)
  - A-5 (highest risk)

### Priority Risk & Needs “Risk Treatment” (aka: Cont. Plan)

#### Potential Aspects (Nonfunctional)

<table>
<thead>
<tr>
<th>Potential Aspects (Nonfunctional)</th>
<th>Conditions</th>
<th>Consequences to the WWTP or Environment (Impact)</th>
<th>Relative Risk</th>
<th>Process Contingency Plan Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG&amp;E Power Interruption</td>
<td>Power failure less than 22 hours. Both site 1U generators fully functional. This assumes generators will have the total 3000 gallons of fuel available.</td>
<td>No impact. Two 1 Megawatt stationary backup generators supply 100% of the plant power needs up to 22 hours if the 3000 gallon diesel fuel tank is full. Additionally, all PLC's have backup power supply units.</td>
<td>None necessary.</td>
<td></td>
</tr>
<tr>
<td>PG&amp;E Extended Power Outage</td>
<td>Power failure more than 22 hours. Both site 1U generator fully functional. This assumes generators will have the total 3000 gallons of fuel available.</td>
<td>Will not be able to power the plant after 22 hours unless backup fuel is brought in.</td>
<td>1. Backup fuel will be purchased from a local supplier after 8 hours (300 gallons remaining). If backup fuel is not readily available, non-critical equipment will be shut down.</td>
<td>1. Backup fuel will be purchased from a local supplier after 8 hours (300 gallons remaining). If backup fuel is not readily available, non-critical equipment will be shut down.</td>
</tr>
<tr>
<td>Partial Equipment Failure: One 1U Generator non-operational due to: 1. Repairs 2. Moderate Earthquake 3. Fire or explosion</td>
<td>Power failure less than 44 hours. One generator will have the total 3000 gallons of fuel available.</td>
<td>All treatment processes will be functional except for the ultraviolet disinfection unit which will not be able to function at 100%. Partial disinfection will be achieved.</td>
<td>1. Backup fuel will be purchased from a local supplier after 24 hours (130 gallons remaining). Shut down non-critical equipment to increase disinfection capabilities.</td>
<td>1. Backup fuel will be purchased from a local supplier after 24 hours (130 gallons remaining). Shut down non-critical equipment to increase disinfection capabilities.</td>
</tr>
<tr>
<td>Partial Equipment</td>
<td>Power Failure more than 44 hours. All treatment processes will be</td>
<td></td>
<td>1. Backup fuel will be purchased from a local supplier after 48 hours (260 gallons remaining).</td>
<td>1. Backup fuel will be purchased from a local supplier after 48 hours (260 gallons remaining).</td>
</tr>
</tbody>
</table>

---

Copyright 2011 All Rights Reserved
### 1. Required by EP Act

1. **Large-scale Ops or complex Environmental issues**
   - **Path 1:** Environmental Audit
   - ID Hazards using Aspects & Impacts (A/I) Register
   - Risk Analysis to priority issues
   - Develop Actions for Risk Treatment
   - Draft the CP
   - Management Endorsement
   - Training, Implementation, Review

### 2. Licensee decision

1. **Large-scale Operations or complex Environmental issues**
   - **Path 2:** ID risks from available information or common knowledge
   - EPA recognized significant risk that needs to be addressed

### 3. EPA Specified Risk

1. **EPA specified risk**
   - Path 3: EPA specified risk

### Example Table

<table>
<thead>
<tr>
<th>Potential Aspects (Malfunctions)</th>
<th>Conditions</th>
<th>Consequences to the WWTP or Environment (Impact)</th>
<th>Relative Risk</th>
<th>Process Contingency Plan Key Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure: One EU Generator non-operational due to: 1. Repairs</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. Moderate Earthquake</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Fire or explosion</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total Equipment failure: 1. Major Earthquake event</td>
<td>No backup generators</td>
<td>Plant will be non-operational</td>
<td>F3</td>
<td>-</td>
</tr>
<tr>
<td>2. Fire or explosion</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Sabotage</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Power Failure (see Power)</td>
<td>During 24 hour period</td>
<td>Failure unlikely; No mechanical parts needed to treat processes</td>
<td>Fl</td>
<td>Bypass raw sewage to batch reactors</td>
</tr>
<tr>
<td>Equipment failure</td>
<td>Design PWF (20 MGD) Operating at 0%</td>
<td>Failure unlikely; No mechanical parts needed to treat processes</td>
<td>F1</td>
<td>Bypass raw sewage to batch reactors</td>
</tr>
<tr>
<td>Wet Weather event</td>
<td>Design PWF (20 MGD) Equipment at 100%</td>
<td>No impact</td>
<td>No impact</td>
<td>None necessary; Unit designed for peak flows of 20 MGD.</td>
</tr>
<tr>
<td>Wet Weather event</td>
<td>Design PWF (20 MGD) Equipment at 4%</td>
<td>Failure unlikely; No mechanical parts needed to treat processes</td>
<td>E1</td>
<td>Bypass raw sewage to batch reactors</td>
</tr>
<tr>
<td>Wet Weather event</td>
<td>10 year storm event (25 MGD) Equipment at 300%</td>
<td>GW removal system has proven to handle flows up to 25 MGD for short durations. Extended durations may cause flow to back up in the sewage system</td>
<td>E3</td>
<td>Bypass raw sewage to batch reactors if grit removal unit becomes overloaded.</td>
</tr>
</tbody>
</table>
Purpose
Contingency Plans (CP’s)

- EPA’s Goal: Provide clear guidance during situations (such as accidental spillages, equipment or plant failure) when things are out of control and often not a good time for decision-making.

But Why Not Wing It When the Sh%%$$%^ Is Hitting the Fan?

- Human error is the single largest cause of things going wrong
- Human error can kill people, hurt people, damage equipment, cause environmental damage, cost $$, etc
- Humans will always err – our job is to design systems that:
  - minimize the likelihood of errors occurring
  - Minimize the impact when errors do occur
Human Error

- Human error is the most common accident cause:
  - "The Origin of Accidents" (1928), Herbert Heinrich examined 75,000 industrial accidents and attributed 88% to "unsafe human acts.
  - Former National Transportation Board Chair Jim Hill has testified before a congressional committee that human error causes 70% of accidents in all walks of life.
  - A Boeing study of major worldwide airline crashes found that 71.7% were due to human error.
  - Reason (Human Error, 1992), studied 180 nuclear power plants in 1983 and 1984 and concluded that human error was 52% of the root causes.
  - Rasmussen et. al. (New Technologies and Error, 1987) found that 88% of all occupational accidents are caused primarily by individual workers.
  - Wood et al. (CSERIAC, 1994) concluded that over 70% of operating room anesthetic incidents involve human error.
  - According to the most complete surveys, over 90% of all highway accidents are caused fully or in part by human error. And of these, 90% are caused by perceptual error and 10% by response error. In short, perception is a factor in over 80% of all highway accidents.

Were these errors committed by bad people or bad organizations?
QUIZ

- Which is easier to change?
  - Conditions, or systems, under which people work
  - OR
  - Human nature

UNDERSTAND:
Human Error Will Always Happen. Your Job is To Reduce the Likelihood Of Occurrence AND Reduce The Impact When It Does Occur.

HOW ERRORS OCCUR

- Human Performance Levels
  - 3 levels of human performance

<table>
<thead>
<tr>
<th>Level</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill Based (SB)</td>
<td>Automatic control of routine tasks with occasional checks</td>
</tr>
<tr>
<td>Rule Based (RB)</td>
<td>Pattern matching prepared rules or solutions to trained-for problems</td>
</tr>
<tr>
<td>Knowledge Based (KB)</td>
<td>Conscious, slow, effortful attempts to solve new problems on the go</td>
</tr>
</tbody>
</table>

Does your staff respond to Large Emergencies on a Frequent Basis?
Then What Risk Control System Do You Have In Place To Make Sure Each Response Goes As Planned?

RULE-BASED ERRORS

• Example:
  - 1988 Clapham Junction RR Collision
    • Northbound commuter train ran into the back of a stationary train after passing a green "all-clear" signal on the tracks
      - 35 ppl died, 500 injured
    • A maintenance worker had re-wired the signal the day before
      - Didn’t cut off or tie back the old wires, just bent them back out of the way (bad work habit)
      - Re-used old insulating tape (bad work habit)
      - The tape came off and the wires came into contact causing a wrong signal to be issued
    • The employee:
      » 12 years on the job
      » Described as hardworking and motivated
      » Never received any formal training - learned by watching others and trying to “figure things” out on his own
      » Result = Bad work habits were never corrected

Lack of Established RULES = People Make Up Their Own Rules...right or wrong
### Where To Start?
What Are Your LF/HR Tasks?

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR LF</td>
<td>HR HF</td>
</tr>
<tr>
<td>LR LF</td>
<td>LR HF</td>
</tr>
</tbody>
</table>

**Risk Control Systems**

What Risk Control Systems Do You Have In Place To Make Sure They Go As Planned EVERY TIME?

### Contingency Plans

- **Our Goal:**
  - Simple
  - User Friendly
  - Pre-planned responses to anticipated problems
**Power Outage**

- **2 BU Gen’s Functional**
- **100% treatment**
- **Start bringing in backup fuel after 8 hours**
  - Fuel demand is 136 gph
  - Approx. 1900 gallons left

---

**Power Outage**

- **1 Generator Functional**
- **Reduced Treatment (UV)**
  - See UV CP
- **Order fuel after 24 hours**
  - Fuel demand is 68 gph
  - Approx. 1632 gallons left
**Power Shedding Procedure**

**Stage 1:** First shut off/donw the following equipment that is not necessary to the operation of the Plant:
- Turn off all building lighting that is not needed.
- Turn off all office computers and printers that are not needed.
- Turn off Water Heaters (301 E-60-HHR).
- Turn off building boiler and circulation pump (302 E-30-HHR).
- Turn off Galley Exhaust fans (207-G-11-FB).
- Turn off Grit building supply fans (206-G-11-FB).
- Turn off Maintenance fan (203-L-11-FB).
- Turn off Filter Building exhaust fans (401-E-01-FB).
- Turn off Welding Shop exhaust fans (701-T-01-FB).
- Turn off Irrigation Pumps (501-P-01-BF).
- Turn off power to Recycle Water Pump Station.

**Stage 2:** If more power is needed to be shed, then turn off the following equipment:
- Turn off Grit Pumps (209 P-01-C, 209 P-02-C).
- Turn off Grit Classifier (201 E-01-G).
- Turn off Elevator (310 E-11-E-31).
- Turn off Rooftop Roof Blowers (300 F-03-FB, 300 F-04-FB).
- Turn off SRB Boiler (302 F-11-FB).
- Turn off Condenser (70 E-01-CDL, 70 E-02-CDL, 70 E-03-CDL).
- Turn off GBT (70 E-05-GTB, 70 E-02-GTB).

**Stage 3:** This stage is only for extreme situations:
- Call the generator supplier for a portable generator to run the UV system.
- After you have called the generator supplier and are waiting for the generator to arrive, begin implementing the following:
  1. On the UV system run two banks only.
  2. If power is needed to be shed, with the two banks on, keep one bank on auto and the other bank turn manual and run that bank at 30% power.
  3. If power is needed to be shed, put both banks to manual and adjust the power setting to 30% power.
  4. If power needs to be shed, run only one bank for partial disinfection so that power is maintained at other treatment units.

---

**Fuel delivered**
- Restart critical equipment
- Continue to monitor fuel supply

**PG&E power is restored**
- Restart non-critical equipment
- Perform plant checks

---

**Stage 1 Equip.**
**Stage 2 Equip.**
**Stage 3** (extreme cases)
- Bring in portable BU Generator
- Decrease UV treatment
Wet Weather Operations Contingency Plan

Grit
1. Monitor system for sewage backups into the system
2. Bypass grit system using the bypass channel if necessary

Sequencing Batch Reactors (SBR)
1. Run all 5 SBRs
2. Manually adjust the rain set points at SCADA following the posted instructions
3. Operate SBRs down to lowest level possible to maintain 1100-1200 mg/L MLSS
4. Implement increased sand filter program
5. Monitor SBR decant quality at SCADA

Sand Filters (SF)
1. Control flow to SFs at secondary effluent valve if necessary
2. Continue to monitor SBR decant quality at SCADA

Ultraviolet Disinfection (UV)
1. Place all 4 UV banks into service
2. Implement increased monitoring of UV effluent

If the SBR decant high solids alarm is triggered, implement 5F bypass contingency plan.

Sand Filter Bypass Contingency Plan
1. Isolate SF’s #1 & #2 which diverts SBR decant to SF’s #3, #4, & #5
2. SF water from #3, #4 & #5 goes to UV
3. If necessary, implement SBR ‘fill & decant’ mode

SBR ‘fill & decant’ mode of operations
1. Ensure SCADA has opened riser and effluent SBR valves for ‘fill & demand’ mode.

Sequencing Batch Reactors (SBR) Contingency Plan

Hydraulic Overflow
Sequencing Batch Reactors (SBR) malfunction
1. SCADA malfunction
2. Operate SBRs from the SBR Touch Pad interface
3. SBR PLC malfunction
4. Fire damages to SBR electrical MCC

Fire damages to SBR electrical MCC
1. SBR electrical control panels have been intentionally staggered so that a fire will not impact all 5 SBRs.
2. Call plant electrician to revive affected SBR to a spare electrical breaker.
3. If plant electrician not available, call Carl Beck at (516)774-1491
4. SBRs are able to maintain adequate treatment with only 3 units for short periods of time.

SBR Pump or Blower Failure
1. 1. Missing pump: spare pump on the shelf.
2. 2. Missing pump: 2 backup pumps on the shelf.
   Note: SBR’s are able to maintain adequate treatment with only 3 units for short periods of time.

One SBR PLC Non-Operative
1. Switch the interlock cable to the backup single line processor.
   Use spare parts from the out-of-service ATAD PLC if cards or another Touch Pad is needed.

Both SBR PLC’s Non-Operative
1. Operate SBR’s manually from SCADA
   a. Print out a visual of the sequence status of each SBR.
   b. Operators will manually operate SBR’s in the proper sequence.
   c. Use mobile communication devices to communicate between operators to open and close SBR valves.
   d. If SCADA is non-operative, use the Touch Pad for a visual of the sequence status of each SBR & follow the steps outlined above.
Is It Possible a CP Will Direct Staff To:

- Perform an unfamiliar task?
- Operate an unfamiliar piece of equipment?
- Ask for non-treatment plant personnel to help?

Then What Risk Mgt Technique Do You Have To Guarantee Success?

Where To Start?
What Are Your LF/HR Tasks?

<table>
<thead>
<tr>
<th>RISK</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF</td>
<td>LR</td>
</tr>
<tr>
<td>HF</td>
<td>HR</td>
</tr>
</tbody>
</table>

What Risk Control Systems Do You Have In Place To Make Sure They Go As Planned EVERY TIME?
WARNING: Do not permit anyone to get hung up in an electric shock. If the cable is not properly grounded, the operator may receive an electric shock. Keep the operator away from the cable and the machine. A good ground is essential. 

1. When the machine is not in use, turn off the power to the machine and lock the controls. 

2. Cut off and store all electrical connections. 

3. Clean the machine to ensure a clean environment. 

4. Store the machine in a secure location. 

5. Mark the location of the machine with a flag or sign. 

Operating the Power Cable Feed

1. Disconnect the power cord from the control panel. 

2. Remove the control panel from the machine. 

3. Clean the machine to ensure a clean environment. 

4. Store the machine in a secure location. 

5. Mark the location of the machine with a flag or sign. 

Operating the (cont.)

From the Manufacturer...

Operating (cont.)

City of Burlingame
Standard Operating Procedure

Spartan Sewer Cleaner (a.k.a. Spartan)

Lift Gate Operations: Loading and Unloading Hand Roder

1. Place Traffic Control as needed. 

2. Lower the lift gate into the working position. 

3. Start the machine and engage the lift gate. 

4. Release the lift gate and take the operator out of the working area. 

5. Move the machine to the storage area and engage the lift gate. 

6. Unload the lift gate and take the operator out of the working area. 

7. Remove the cover from the lift gate and remove the lift gate. 

8. Replace the cover on the lift gate and store it. 

9. Store the lift gate in a secure location. 

10. Mark the location of the lift gate with a flag or sign. 

Copyright 2011 All Rights Reserved
As We Conclude, Remember:

NOTE:
Compliance is **NOT** the Gold Standard

**It Is The Minimum Standard.**

**ANY** Organization’s goal should be **RISK MANAGEMENT**
Ask Yourself...How Comfortable Are You **DEFENDING**
Your State of Preparedness?

- MEDIA
- Reg. Board
- Env Groups
- EPA
- SWRCB
- F&G

THANK YOU!

David Patzer  
DKF Solutions Group, LLC  
707.373.9709  
Dpatzer@dkfsolutions.com
Go beyond scratch paper and loose forms with Defensible Overflow Volume Estimation

Please Contact Me For More Information.

Visit www.dkfsolutions.com/smartEST for more information or to order today.