SCIRT Rebuilding Infrastructure

LEARNING LEGACY

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

SCIRT service strikes bowtie diagram

Story: Utilities Location and Protection

Theme: Programme Management

A bowtie diagram which SCIRT used to evaluate the risks associated with and analyse the causal relationships associated with service strikes.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit www.scirtlearninglegacy.org.nz

Programme funded by Christchurch City Council New Zealand Government

city care Our people. Making it work. Downer Relationships creating success Fulton Hogan McCONNELL DOWELL CREATIVE CONSTRUCTION Fletcher

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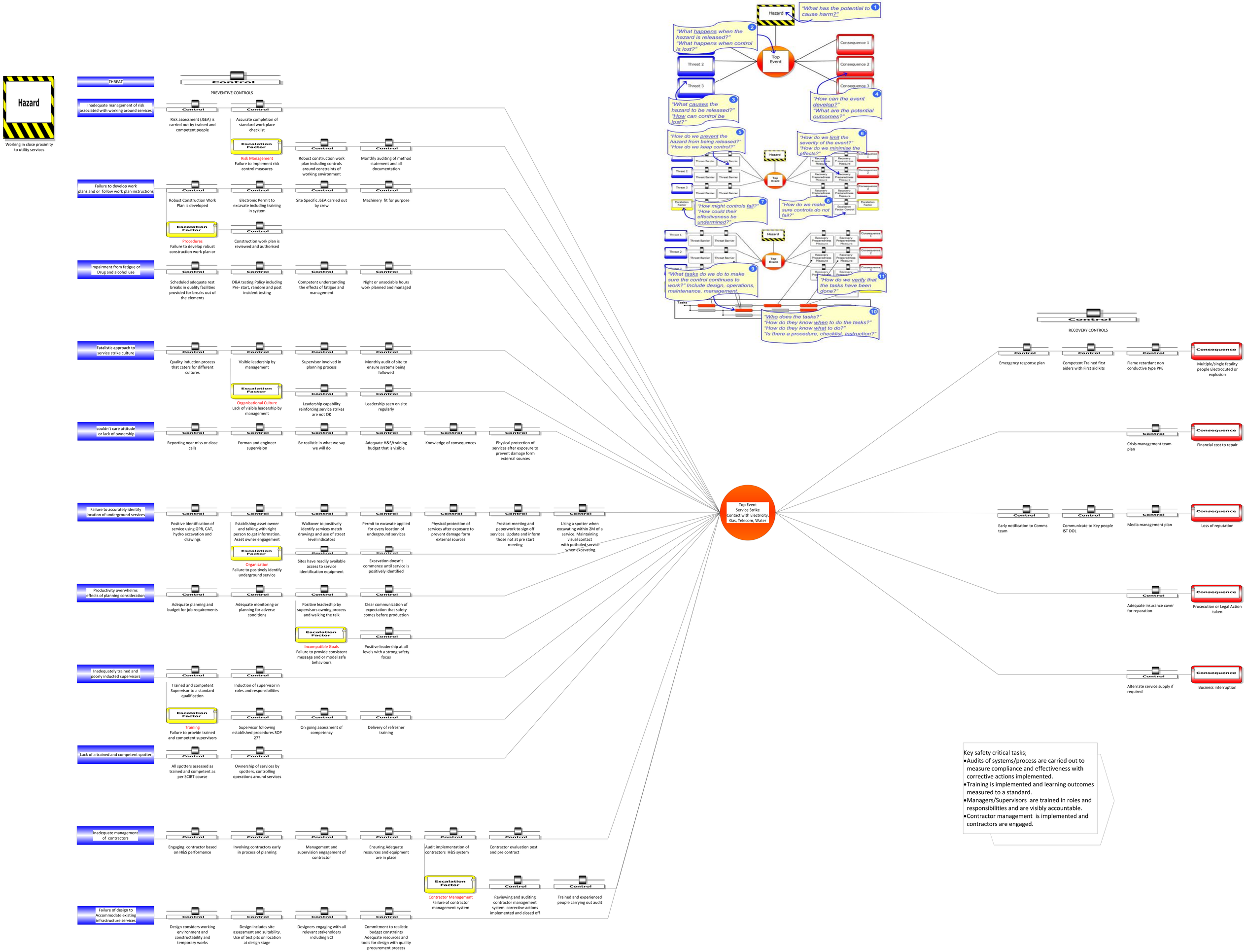
Hazard
Working in close proximity to utility services
THREAT
Control
PREVENTIVE CONTROLS
Inadequate management of risk associated with working around services
Risk assessment (JSEA) is carried out by trained and competent people
Accurate completion of standard work place checklist
Escalation Factor
Risk Management
Failure to implement risk control measures
Robust construction work plan including controls around constraints of working environment
Monthly auditing of method statement and all documentation
Failure to develop work plans and or follow work plan instructions
Robust Construction Work Plan is developed
Electronic Permit to excavate including training in system
Site Specific JSEA carried out by crew
Machinery fit for purpose
Procedures
Failure to develop robust construction work plan or
Construction work plan is reviewed and authorised
Impairment from fatigue or Drug and alcohol use
Scheduled adequate rest breaks in quality facilities provided for breaks out of the elements
D&A testing Policy including Pre- start, random and post incident testing
Competent understanding the effects of fatigue and management
Night or unsociable hours work planned and managed
Fatalistic approach to service strike culture
Quality induction process that caters for different cultures
Visible leadership by management
Supervisor involved in planning process
Monthly audit of site to ensure systems being followed
Organisational Culture
Lack of visible leadership by management
Leadership capability reinforcing service strikes are not OK
Leadership seen on site regularly
Couldn't care attitude or lack of ownership
Reporting near miss or close calls
Forman and engineer supervision
Be realistic in what we say we will do
Adequate H&S/training budget that is visible
Knowledge of consequences
Physical protection of services after exposure to prevent damage form external sources
Failure to accurately identify location of underground services
Positive identification of service using GPR, CAT, hydro excavation and drawings
Establishing asset owner and talking with right person to get information. Asset owner engagement
Walkover to positively identify services match drawings and use of street level indicators
Permit to excavate applied for every location of underground services
Physical protection of services after exposure to prevent damage form external sources
Prestart meeting and paperwork to sign off services. Update and inform those not at pre start meeting
Using a spotter when excavating within 2M of a service. Maintaining visual contact with potholed service when excavating
Organisation
Failure to positively identify underground service
Sites have readily available access to service identification equipment
Excavation doesn't commence until service is positively identified
Productivity overwhelms effects of planning consideration
Adequate planning and budget for job requirements
Adequate monitoring or planning for adverse conditions
Positive leadership by supervisors owning process and walking the talk
Clear communication of expectation that safety comes before production
Incompatible Goals
Failure to provide consistent message and or model safe behaviours
Positive leadership at all levels with a strong safety focus
Inadequately trained and poorly inducted supervisors
Trained and competent Supervisor to a standard qualification
Induction of supervisor in roles and responsibilities
Training
Failure to provide trained and competent supervisors
Supervisor following established procedures SOP 27?
On going assessment of competency
Delivery of refresher training
Lack of a trained and competent spotter
All spotters assessed as trained and competent as per SCIRT course
Ownership of services by spotters, controlling operations around services
Inadequate management of contractors
Engaging contractor based on H&S performance
Involving contractors early in process of planning
Management and supervision engagement of contractor
Ensuring Adequate resources and equipment are in place
Audit implementation of contractors H&S system
Contractor evaluation post and pre contract
Contractor Management
Failure of contractor management system
Reviewing and auditing contractor management system corrective actions implemented and closed off
Trained and experienced people carrying out audit
Failure of design to Accommodate existing infrastructure services
Design considers working environment and constructability and temporary works
Design includes site assessment and suitability. Use of test pits on location at design stage
Designers engaging with all relevant stakeholders including ECI
Commitment to realistic budget constraints Adequate resources and tools for design with quality procurement process
Top Event
Service Strike
Contact with Electricity, Gas, Telecom, Water
"What has the potential to cause harm?"
"What happens when the hazard is released?"
"What happens when control is lost?"
Threat 2
Threat 3
Consequence 1
Consequence 2
Consequence 3
"What causes the hazard to be released?"
"How can control be lost?"
"How can the event develop?"
"What are the potential outcomes?"
"How do we prevent the hazard from being released?"
"How do we keep control?"
"How do we limit the severity of the event?"
"How do we minimise the effects?"
"How might controls fail?"
"How could their effectiveness be undermined?"
"How do we make sure controls do not fail?"
Threat 1
"What tasks do we do to make sure the control continues to work?" Include design, operations, maintenance, management
"Who does the tasks?"
"How do they know when to do the tasks?"
"How do they know what to do?"
"Is there a procedure, checklist, instruction?"
"How do we verify that the tasks have been done?"
Tasks
RECOVERY CONTROLS
Emergency response plan
Competent Trained first aiders with First aid kits
Flame retardant non conductive type PPE
Consequence
Multiple/single fatality people Electrocuted or explosion
Crisis management team plan
Financial cost to repair
Early notification to Comms team
Communicate to Key people IST DOL
Media management plan
Loss of reputation
Adequate insurance cover for reparation
Prosecution or Legal Action taken
Alternate service supply if required
Business interruption
Key safety critical tasks;
•Audits of systems/process are carried out to measure compliance and effectiveness with corrective actions implemented.
•Training is implemented and learning outcomes measured to a standard.
•Managers/Supervisors are trained in roles and responsibilities and are visibly accountable.
•Contractor management is implemented and contractors are engaged.