

San Bruno Pipeline Failure

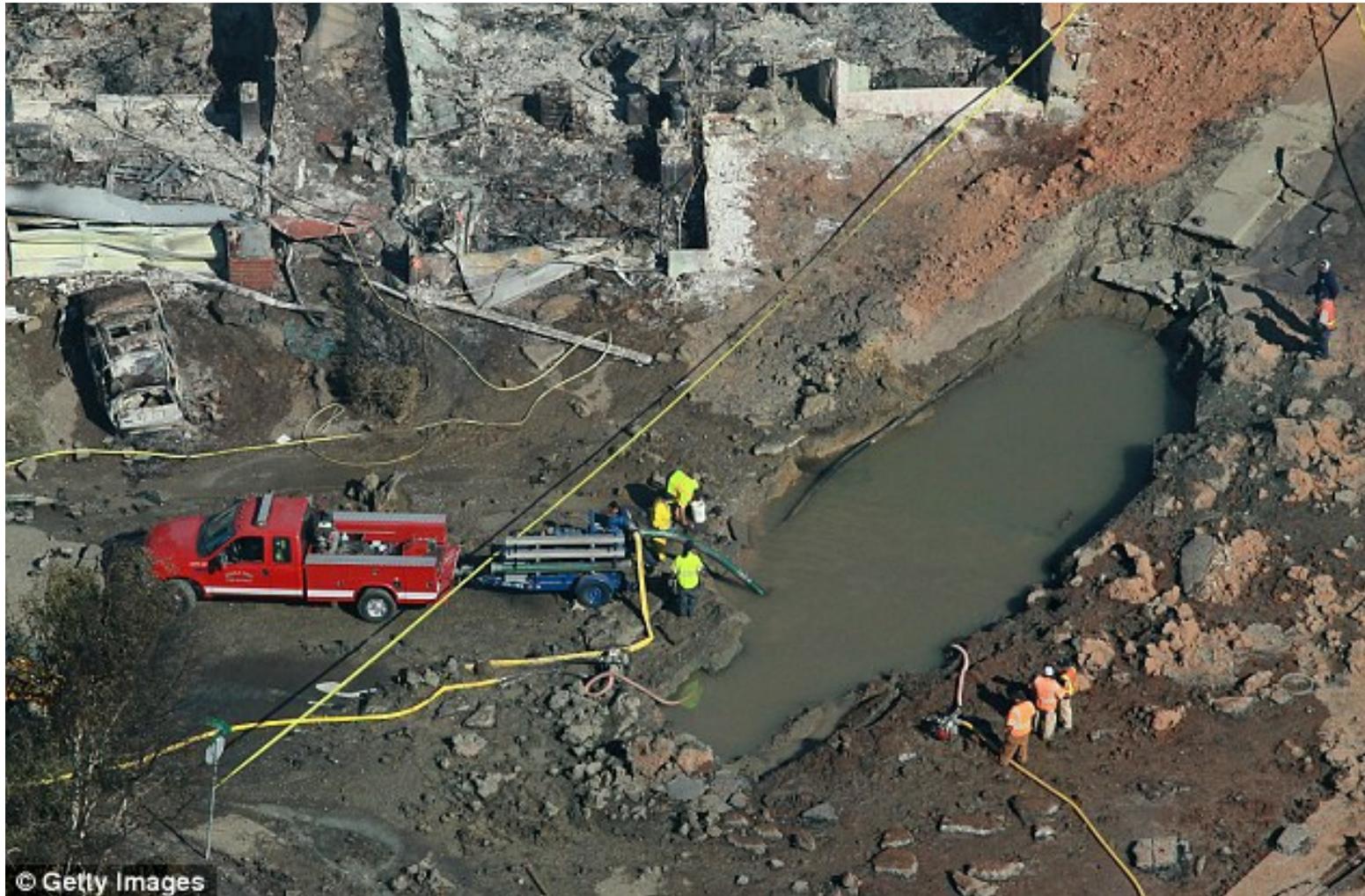


Presentation for UKOPA – October 2011
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Background

- Gas pipeline failure in San Bruno, near San Francisco, on 9 September 2010.
- Killed 8 people and destroyed 38 homes.
- Pipeline operated by Pacific Gas & Electric (PG&E)
- Failure resulted in a rupture and ignited release. Fire lasted 1hr 46m until isolated.
- 30" diameter, X42, 0.375" (9.5mm) wall thickness, LSAW.
- Section that failed was constructed in 1956 (original pipeline was constructed in 1948).
- 6 short pipeline sections (pups) with mitre joints in the vicinity of the failure and 5 pups were included in the rupture. Failure occurred on the longitudinal weld on one of the sections of pipe.
- Max operating pressure was 375 psig (25 barg). Design factor 0.38.
- Pressure increased up to 386 psig prior to the failure (maximum allowable operating pressure was 400 psig).
- This pipeline section could not be inline inspected (although it is debatable whether inline inspection would have detected the faulty weld).
- The failure occurred below a road junction with a depth of cover of about 3 feet.
- The section of pipeline that failed was planned to be replaced in 2012

San Bruno, California, 2010



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San Bruno Pipeline Failure – Technical Root Cause

- The investigation identified that both the material and the fabrication welds of the section of pipeline that failed did not meet either the engineering standards
- Pipeline had been in place for more than 50 years it is believed that some other event must have triggered the failure.
- Sewer replacement project in the vicinity in 2008 that utilised pipe bursting technology, but it has not been proven that was a contributing cause.



Key Players

- The Pacific Gas and Electric Company - PG&E – the Pipeline Operator
- California Public Utilities Commission (CPUC) the regulator in terms of rate-setting, overall service and safety
- Safety matters associated with pipeline facilities are subject to state authority and an annual certification to the United States Department of Transportation's (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA).
- National Transportation Safety Board (NTSB), an independent agency with oversight over transportation accidents
- American Gas Association (AGA) – Trade organisation representing American gas supply companies

Key Reports/Documents

- **California Public Utilities Commission Independent panel Report**
- **National Transmission Safety Board Report – 9 September 2010**
- **Letter to the Pipeline and Hazardous Materials Safety Administration from the American Gas Association 29th August 2011**

California Public Utilities Commission

Independent panel Findings

- Too much focus on occupational safety of employees rather than focus on public safety
- Data management – lack of robust data and document information systems
- Threat identification – not identifying pipeline threats and not identifying high risk sections hence not mitigating these threats
- Spirit of compliance – efforts targeted on meeting regulations
- Organisational effectiveness
 - PG&E’s gas transmission operations were spread over several integrated electric and gas organisational units.
 - The organization did not have clear divisions of responsibility between gas transmission and gas distribution functions
- Resource allocation – no coherent planning to maintain and modernise the system
- Lack of strategic integrity plan including extending the use of ILI (only 21% of PG&E’s system can be ILI’d)

NTSB Findings

- The pipeline would not have met the QA or welding standards in place in 1956
- Fracture originated in the partially welded seam which was weakened through ductile and fatigue crack growth
- The sewer line installation in 2008 did not damage the pipe
- PG&E lacked detailed procedures for responding to a large scale emergency
- PG&E supervisory control and data acquisition systems contributed to the delays in responding to the incident
- Shutoff valves would have significantly reduced the time to isolate the rupture
- Grandfathering of older pipelines had meant that the pipeline had not had to undergo a hydro test
- PG&E and the regulator (California Public Utilities Commission) have not incorporated the use of effective and meaningful metrics into their performance based safety management system
- The Pipeline and Hazardous Materials Safety Administration integrity management inspection protocols are inadequate – their enforcement programme and its monitoring of state oversight programs have been weak and have resulted in lack of effective Federal oversight and State oversight by the California Public Utilities Commission

Letter to the Pipeline and Hazardous Materials Safety Administration from the American Gas Association (AGA)

- Letter reinforced AGA commitment to pipeline safety and summarised some of the current safety initiatives they were involved with including:
 - The creation of technical task forces to develop guidance on how to determine fitness for purpose
 - Safety information sharing – developing a model that will measurably improve pipeline safety
 - Sponsored technical paper on the effectiveness of remotely controlled valves
 - Technical workshops, teleconference and other events to share information