

[REDACTED]

From: [REDACTED]
Sent: Tuesday, December 26, 2023 10:45 AM
To: Rosauer, Michael; Brewster Birdsall
Cc: [REDACTED] Garcia, Albert J; [REDACTED]; Susan Lee; Henriquez, Roxanne; [REDACTED]
Walker, Brian J; [REDACTED]
Subject: RE: [EXTERNAL] RE: Ventura Compressor Station Modernization Project- Methodology Discussion for Impact Analysis, Accident or Upset Conditions

Thank you. I will send out an invite for 1/12 at noon

From: Rosauer, Michael <michael.rosauer@cpuc.ca.gov>
Sent: Friday, December 22, 2023 11:41 AM
To: Brewster Birdsall <Bbirdsall@aspeneq.com>
Cc: [REDACTED]@socialgas.com>; [REDACTED]@socialgas.com>; Garcia, Albert J <AGarcia6@socialgas.com>; [REDACTED]@socialgas.com>; Susan Lee <Slee@aspeneq.com>; Henriquez, Roxanne <Roxanne.Henriquez@cpuc.ca.gov>; [REDACTED]@socialgas.com>; Walker, Brian J <BWalker2@socialgas.com>; [REDACTED]@socialgas.com>; [REDACTED]@socialgas.com>
Subject: Re: [EXTERNAL] RE: Ventura Compressor Station Modernization Project- Methodology Discussion for Impact Analysis, Accident or Upset Conditions

CAUTION! EXTERNAL SENDER, STOP, ASSESS, AND VERIFY

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Thanks Brewster. That time/date works for me.
Mike
Sent from my iPhone

On Dec 22, 2023, at 10:58 AM, Brewster Birdsall <Bbirdsall@aspeneq.com> wrote:

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Hi [REDACTED] & Team –

My schedule is flexible too (10-4 each day).

Now I'm finding the rest of the team tough to reach, with holiday spirit kicking in. Can we lock down a date and time for this?, even if it turns out to be a placeholder. My suggestion is Friday Jan 12 at 12 noon (Pacific).

Thanks – happy holidays!

- Brewster

From: Rosauer, Michael <michael.rosauer@cpuc.ca.gov>
Sent: Thursday, December 21, 2023 1:58 PM
To: [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>; Brewster Birdsall <Bbirdsall@aspeneq.com>
Cc: [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>; Garcia, Albert J <AGarcia6@socialgas.com>; [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>; Susan Lee <Slee@aspeneq.com>; Henriquez, Roxanne <Roxanne.Henriquez@cpuc.ca.gov>; [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>; Walker, Brian J <BWalker2@socialgas.com>; [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>; [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>
Subject: RE: [EXTERNAL] RE: Ventura Compressor Station Modernization Project- Methodology Discussion for Impact Analysis, Accident or Upset Conditions

Thanks [REDACTED],
My schedule is flexible on either of those dates. I will allow the Aspen Team to respond with their preferred date.

Mike

From: [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>
Sent: Thursday, December 21, 2023 1:48 PM
To: Rosauer, Michael <michael.rosauer@cpuc.ca.gov>; 'Brewster Birdsall' <Bbirdsall@aspeneq.com>
Cc: [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>; Garcia, Albert J <AGarcia6@socialgas.com>; [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>; 'Susan Lee' <Slee@aspeneq.com>; Henriquez, Roxanne <Roxanne.Henriquez@cpuc.ca.gov>; [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>; Walker, Brian J <BWalker2@socialgas.com>; [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>; [REDACTED] <[\[REDACTED\]@socialgas.com](mailto:[REDACTED]@socialgas.com)>
Subject: [EXTERNAL] RE: Ventura Compressor Station Modernization Project- Methodology Discussion for Impact Analysis, Accident or Upset Conditions

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Hi Mike and Brewster,

Per our meeting last week, see below for the methodology for the Quantitative Risk Analysis (QRA) for the Proposed Project.

The intent of the QRA is to:

1. Assess the potential consequences of accidental releases of natural gas from all flammable gas systems;
1. Assess the frequency/probability of these upset conditions; and
2. Evaluate the potential impacts of the Proposed Project to persons in the Proposed Project area, primarily the offsite public.

The scope of the QRA study will include:

1. The existing SoCalGas Ventura Compression Station systems, as a reference case;
2. The Proposed Project (with the basis that the existing systems are decommissioned);
 1. Inlet, compression, and outlet portions of each system, including fuel gas; and
 2. All intended modes of operation for each system.

The QRA study will follow these steps:

1. Identification of flammable hazards associated with natural gas and fuel gas;
2. Define failure cases (loss of containment), for all flammable gas systems in the facility;
3. Comprehensive consequence analysis involving a range of hole sizes, release orientations, weather conditions, ignition timings, etc.;
4. Assignment of release frequencies (based on failure rate database information) and conditional probabilities to each unique event;
5. Risk mapping, or combination of consequences and probability for generation of measures of risk (primarily location-specific individual risk contours); and
6. Risk assessment.

Regarding the methodology for analyzing the Alternatives, we would like our technical team to meet with your technical team to discuss. The SoCalGas technical team is available on January 12th or 15th.

Thank you and please let us know what time works you and your team,

<image003.jpg>

[Redacted]
[Redacted] Regulatory Affairs
[Redacted]
555 W. 5th Street | Los Angeles, CA 90013 | GT14D6

From: [Redacted] <[Redacted]@socialgas.com>
Sent: Monday, December 11, 2023 4:10 PM
To: 'Rosauer, Michael' <[Redacted]@socialgas.com>; 'Brewster Birdsall' <[Redacted]@socialgas.com>
Cc: [Redacted] <[Redacted]@socialgas.com>; Garcia, Albert J <[Redacted]@socialgas.com>; [Redacted] <[Redacted]@socialgas.com>; [Redacted] <[Redacted]@socialgas.com>; 'Susan Lee' <[Redacted]@socialgas.com>; 'Henriquez, Roxanne' <[Redacted]@socialgas.com>; [Redacted] <[Redacted]@socialgas.com>; Walker, Brian J <[Redacted]@socialgas.com>; [Redacted] <[Redacted]@socialgas.com>
Subject: Ventura Compressor Station Modernization Project- Methodology Discussion for Impact Analysis, Accident or Upset Conditions

Good afternoon Mike and Brewster,

We wanted to schedule the meeting to discuss the Methodology for the Impact Analysis for Accident/Upset Conditions which would include our consultant and Aspen's risk person.

Would you all be available at either the following times this week:

1. Friday, 12/15, 10am-11am pst (Preferred)
2. Thursday, 12/14, 3pm-4pm pst

Thanks.

[Redacted]
Regulatory Affairs
SoCalGas
[Redacted]

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Ventura Compression Station Quantitative Risk Analysis (QRA)

Study Purpose

- ◆ Evaluate the proposed modifications to the SoCalGas Ventura Compression Station
- ◆ Assess potential consequences of accidental releases of natural gas and fluids from all flammable gas systems
- ◆ Assess frequency/probability of upset conditions
- ◆ Address public safety considerations; inform facility siting and final design efforts

QRA Scope

- ◆ Existing compression systems QRA (reference)
- ◆ Future compression systems QRA (future condition with existing decommissioned)
- ◆ For both existing and future:
 - Inlet gas
 - Compression
 - Outlet gas
 - Fuel gas system
- ◆ All intended modes of operation for the facility

What is a QRA?

**Quantitative
Risk
Analysis**

**Quantitative
Risk
Assessment**

**Qualitative
Risk
Analysis**

**Qualitative
Risk
Assessment**

*The USA has no regulatory guidelines/standards for QRA
This QRA will use industry standard practices*

What is Risk?

A measure of economic loss or human injury in terms of both the incident **likelihood** and the **magnitude** of the loss or injury.

Likelihood: chance, frequency, probability....

Magnitude: consequence, impact....

Risk = consequence x likelihood

Risk = consequence x likelihood x vulnerability

What Makes Risk Quantitative?

Definition: CPQRA

CCPS [2000] Guidelines for Chemical Process Quantitative Risk Analysis

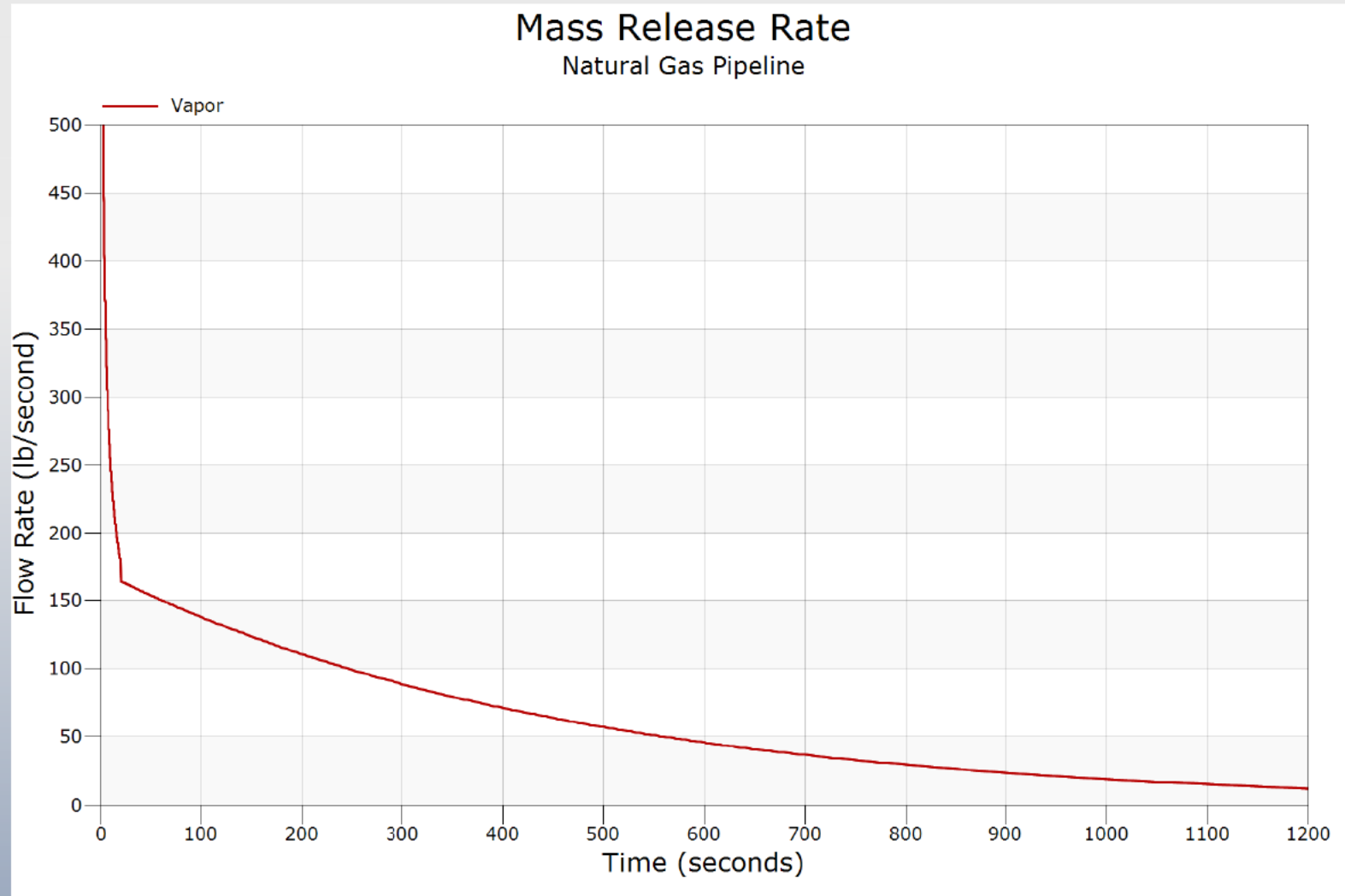
“It is the process of hazard identification followed by a **numerical** evaluation of incident consequences *and* frequencies, and their **combination** into an overall measure of risk when applied to the chemical process industry.”

→ **Comprehensive**

Quantitative Risk Analysis (QRA)

- ◆ Hazard Identification
 - Natural gas, fuel gas: flammable hazards only
- ◆ Failure cases (loss of containment for flammable fluids)
 - Represent all flammable gas systems in the facility
- ◆ Comprehensive consequence analysis
 - Range of hole sizes, release orientations, weather conditions, etc.
- ◆ Frequency analysis: release frequencies * conditional probabilities
- ◆ Risk mapping
 - Generation of measures of risk

Consequence Analysis: Release Modeling



Example release from natural gas pipeline @ 1000 psia;
10 miles of pipe; 12" rupture



Consequence Analysis: Hazard Modeling

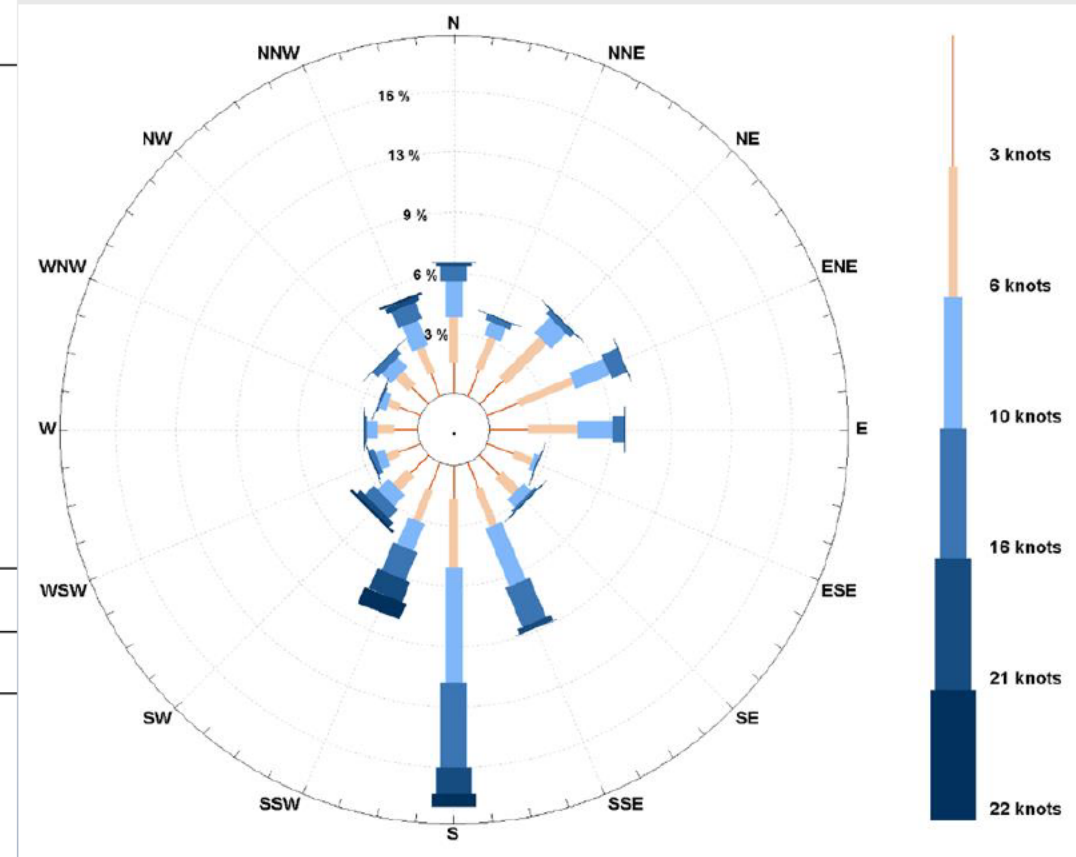
- Thermal radiation from a jet fire - immediate ignition
- Thermal radiation from a jet fire - delayed ignition
- Exposure to a flammable vapor cloud that is ignited
- Exposure to a blast wave following ignition of a flammable vapor cloud within a confined/congested area

How Do You Make a Consequence Analysis Comprehensive?

- Multiple release scenarios in the facility 20
 - Multiple hole sizes for each release scenario 5
 - Multiple hazard types/ignition timings for each hole size ~5
 - Multiple weather conditions for each hazard type 21
 - Multiple wind directions for each weather condition 16
- Total hazard footprint maps → ~168,000*

How Do You Make a Consequence Analysis Comprehensive?

Failure Case	Release Hole Size	Ignition Timing	Outcome	
Release of Hazardous Material	Rupture	
		
		
	Major
	
	
	
	Moderate	...	immediate	Jet Fire
		...	delayed	Flash Fire/Jet Fire/VCE
		...	none	Dissipation
Leak	
	
	



What Is a Probability?

The chance that a given event or event outcome will occur (in a one-year period).

Based on: equipment failure frequencies, conditional probabilities, and engineering analysis.

Probability Development

- ◆ Release frequencies primarily from the United Kingdom (UK) Hydrocarbon Releases Database (HCRD)
 - Failure frequency by equipment type
 - Equipment groupings
- ◆ Conditional probabilities
 - Operational mode
 - Hole size distribution (from HCRD)
 - Release orientation (vertical, horizontal, ...)
 - Weather: wind speed, atmospheric stability, wind direction
 - Ignition: immediate, delayed, none

Quantitative Risk Analysis (QRA)

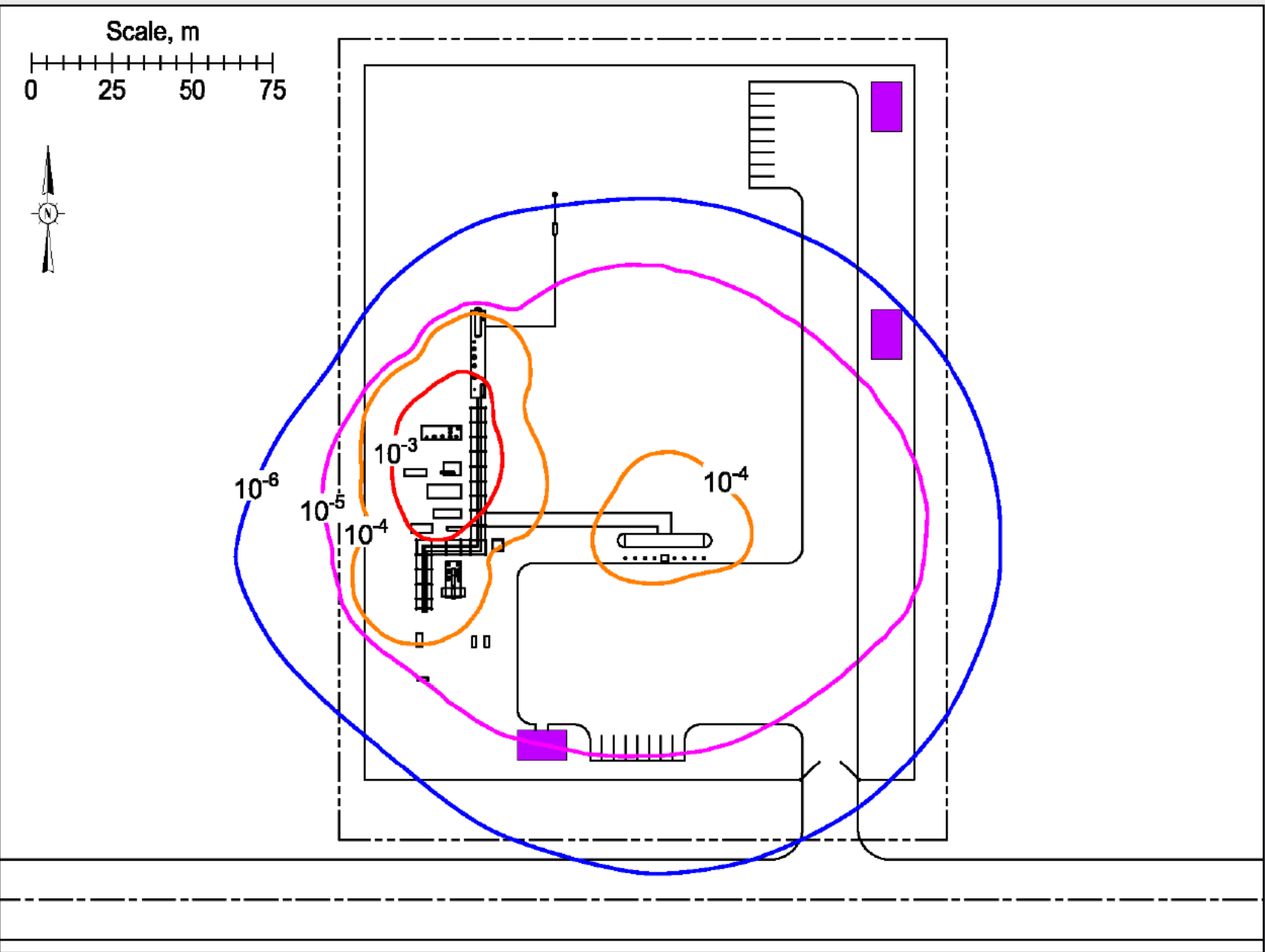
- ◆ Hazard Identification
 - Natural gas, fuel gas: flammable hazards only
- ◆ Failure cases (loss of containment for flammable fluids)
 - Represent all flammable gas systems in the facility
- ◆ Comprehensive consequence analysis
 - Range of hole sizes, release orientations, weather conditions, etc.
- ◆ Frequency analysis: release frequencies * conditional probabilities
- ◆ Risk mapping
 - Generation of measures of risk
- ◆ Risk assessment

How Do You Measure Risk?

Consequence and Probability are combined to generate a measure of risk:

- ~~• Risk matrices (qualitative)~~
- LSIR: location-specific individual risk (contours) (quantitative)
 - Used for onsite, offsite risk
- IRPA: individual risk per annum (quantitative)
 - Used for onsite risk by occupancies

Illustrative Example: Location-Specific Individual Risk (LSIR) Contours



Concluding Remarks

- ◆ QRA allows quantitative, detailed analysis for consequences and probabilities of natural gas hazards across a wide range of conditions
- ◆ This QRA provides a comparison of the existing system to the proposed future system
- ◆ Allows for assessment of public safety
- ◆ Allows for detailed assessments of facility siting and final design



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Thank You!

Jeff Marx, jdm@questconsult.com

Process Safety and Risk Management Services