# Kinder Morgan Pipeline Assessment

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### ISSUES

- Manual vs. automatic valves
- If the pipeline breaks, where will the product flow
- What happens in an earthquake
- What happens if product gets into the storm drain























#### **Probability of Pipeline Failure**

- All refined product pipelines in California 1986-2001
- Annual failure probability— 1.3 x 10<sup>-3</sup>
- One incident every 769 years
- No. 1 cause of failure third party damage
- Earthquake

#### Earthquakes and Pipelines

- Failure mechanisms
- Ground shaking
- Liquefaction/lateral spreading
- Landslides
- Maximum credible earthquake MMI 6.6
- Newport-Inglewood Fault 7 miles SW
- Failure probability 5.1 x 10<sup>-3</sup>
- Once every 196 years

#### Earthquakes and Pipelines (cont.)

- Northridge Earthquake -1994
- All petroleum product pipelines shut down within 1 minute – regulatory requirement
- 2 petroleum pipeline breaks
- Kinder Morgan pipeline low probability of break given earthquake occurs
- Buried 3 feet below ground surface
- Steel pipelines ductile less susceptible to ground movement
- New pipe (<25 yrs old) corrosion less likely</li>

### Pipeline Failure – What Happens and Where Does the Product Go?

- Leak 5 times more likely than full break
- Product travels along backfill below ground surface
- Most likely never reaches the surface
- Worst case scenario full pipeline rupture

#### Pipeline Shutdown and Manual vs Automatic Valves

- Manual shutoff valves Ortega Highway and Talega Creek – 14.6 miles apart
- One-way check valve La Pata Road
- Kinder Morgan control center Orange, CA
- Staffed with 16 people operating 24/7
- Continuous monitoring of pipeline for pressure, flow rate, temperature, etc. with SCADA system
- Automatic shutdown time 0 to 30 seconds, assume 1 minute

### What Happens After Shutdown?

- Pumps turned off
- Assume discharge of product for one minute prior to shutdown
- 6,000 bbl/hr = 4,200 gallons in one minute
- Distance to school site = 2,150 feet
- 7 football fields
- Product adsorbed into soil
- Never reaches school site



#### What Happens After Shutdown?

- In addition to product released during shutdown period
- Gravity drainage from pipeline
- Amount discharged based on elevation profile and break location















#### How Much Product Is Released?

Distance from High Point (ft)	Amount Released During Shutdown (gal)	Amount Released During Gravity Drainage (gal)	Total Amount Released (gal)
0	4,200	0	4,200
500	4,200	5,221	9,421
1,000	4,200	10,442	14,642
4,300	4,200	44,901	49,101
80-foot Round Pool, 4 feet deep			

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#### How Far Will Product Travel?

- Worst case scenario 49,100 gallons released – volumes of 2.3 aboveground swimming pools
- Discharge into drainage channel
- Lateral spreading, infiltration, adhesion, and evaporation
- Assume 30 foot wide channel
- Product infiltrates into soil within 300 to 600 feet
- Distance from pipeline to storm drain 2,100 feet
- Product will not reach storm drain

## The End

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