YUCCA MOUNTAIN PROJECT

Studies

# Use of Unsaturated Zone Flow Model Expert Elicitation Results in TSPA-VA

Presented to:
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# Methods used to incorporate results of expert elicitation in TSPA-VA

- Conduct sensitivity studies to evaluate the potential effect of the issue
- Incorporate recommendation directly
  - Evaluate significance of alternative models or parameters
  - Weight distributions according to elicitation

# Key output of UZ flow model expert elicitation and incorporation into TSPA-VA

| | |
|---|---|
| **Net average infiltration rate** | **Use PDF to define representative infiltration rates (and weights) and "re-calibrate" the UZ flow model** |
| **Spatial / temporal variability of infiltration rate** | **Use alternate infiltration rate distributions defined by expert elicitation in UZ flow model** |

# Key output of UZ flow model expert elicitation and incorporation into TSPA-VA

(Continued)

Lateral diversion of flux and spatial/temporal variability of percolation flux

Net average percolation flux and fracture/matrix flux distribution

Use alternate infiltration rates and UZ flow model to confirm dampening of flux variability with depth as elicited from experts

Use results of UZ flow model with uncertain net average infiltration rate PDF to confirm percolation flux PDF and % fracture flux from expert elicitation

# Key output of UZ flow model expert elicitation and incorporation into TSPA-VA

(Continued)

| | |
|---|---|
| Seepage flux | Use results of drift-scale models with variable matrix and fracture properties to confirm expected range of seepage between 0.1 to 10% of repository area. Correlate seepage flux and area to percolation flux and properties variability |

# Conclusions

- Expert elicitation provided another means to develop reasonable ranges of key input values for the unsaturated zone flow model
- These ranges (appropriately weighted) will be used in TSPA-VA, as confirmed by UZ flow model
- Additional elicitations are underway in other key aspects of total system performance (e.g., waste package degradation and saturated zone flow and transport)

# Example application of results of expert elicitation

- Uncertainty in average percolation flux
- Variability in average percolation flux
- Variability in average seepage flux

# Example discrete appropriation of average percolation flux PDF

| | Percentile | Weight | Spatial and Temporal Average |
|---|---|---|---|
| Model 1 | 3.5 | 0.1 | 1 mm/yr |
| Model 2 | 21 | 0.24 | 4 mm/yr |
| Model 3 | 50 | 0.32 | 7 mm/yr |
| Model 4 | 79 | 0.24 | 15 mm/yr |
| Model 5 | 96.5 | 0.1 | 34 mm/yr |

# Example spatial percolation flux variability

| | Area 1 | | | Area 2 | | | Area 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| Model | % Total Area | % Total Flux | Avg. Flux in Area | % Total Area | % Total Flux | Avg. Flux in Area | % Total Area | % Total Flux | Avg. Flux in Area |
| 3.1 | 30 | 30 | 7 | 30 | 30 | 7 | 40 | 40 | 7 |
| 3.2 | 30 | 60 | 14 | 30 | 30 | 7 | 40 | 10 | 1.8 |
| 3.3 | 30 | 90 | 21 | 30 | 0 | 0 | 40 | 10 | 1.8 |
| 3.4 | 20 | 60 | 21 | 30 | 30 | 7 | 50 | 10 | 1.4 |
| 3.5 | 20 | 90 | 31 | 30 | 0 | 0 | 50 | 10 | 1.4 |
| 3.6 | 10 | 60 | 42 | 30 | 30 | 7 | 60 | 10 | 1.2 |
| 3.7 | 10 | 90 | 63 | 30 | 0 | 0 | 60 | 10 | 1.2 |

# Example spatial percolation flux components in fractures

| | Area 1 | | Area 2 | | Area 3 | | |
|---|---|---|---|---|---|---|---|
| Model | % Total Area | % Area w/ Seeps | % Total Area | % Area w/ Seeps | % Total Area | % Area w/ Seeps | Total % Area w/ Seeps |
| 3.1 | 30 | 1 | 30 | 1 | 40 | 1 | 1 |
| 3.2 | 30 | 3 | 30 | 1 | 40 | 0 | 1.2 |
| 3.3 | 30 | 6 | 30 | 0 | 40 | 0 | 1.8 |
| 3.4 | 20 | 6 | 30 | 1 | 50 | 0 | 1.5 |
| 3.5 | 20 | 12 | 30 | 0 | 50 | 0 | 2.4 |
| 3.6 | 10 | 18 | 30 | 1 | 60 | 0 | 2.1 |
| 3.7 | 10 | 36 | 30 | 0 | 60 | 0 | 3.6 |