HLWYM HEmails

From: Osvaldo Pensado
Sent: Thursday, May 05, 2005 10:31 AM
To: Sitakanta Mohanty; rfedors@cnwra.swri.edu; Ronald Green; Budhi Sagar; Goodluck Ofoegbu
Cc: Brandi Winfrey
Subject: RE: thermal conductivity

Brandi,

Please update the following distribution

triangular
ThermalConductivityOfBackfillModelOne[W/(m-C)]
0.15,0.24,1.0

The mode at 0.24 is selected to match Ron Green's average value of 0.46 W/m-K.

We may update the distribution and still own you a revised rationale.

> -----Original Message-----
> **From:** Sitakanta Mohanty [mailto:smohanty@cnwra.swri.edu]
> **Sent:** Wednesday, May 04, 2005 7:16 PM
> **To:** rfedors@cnwra.swri.edu; opensado@cnwra.swri.edu; 'Ron Green'; 'Budhi Sagar'; 'Goodluck Ofoegbu'
> **Subject:** RE: thermal conductivity
>
> Osvaldo,
> For you to move forward with the validation, my recommendation is to use the range Randy has provided. In the mean time, let the discussion continue until we better constrain the range. When the distribution is finalized, you may re-run several of your calculations to ensure that the results are still correct. We should also exercise the rubble size distribution-based model to get a handle on thermal conductivities.
> -Sitakanta
>
> > -----Original Message-----
> > **From:** Randall Fedors [mailto:rfedors@cnwra.swri.edu]
> > **Sent:** Wednesday, May 04, 2005 5:30 PM
> > **To:** opensado@cnwra.swri.edu; 'Ron Green'; 'Budhi Sagar'; 'Goodluck Ofoegbu'
> > **Cc:** 'Sitakanta Mohanty'
> > **Subject:** RE: thermal conductivity
> >
> > The DOE measured (MSTHM AMR 2004) the thermal conductivity of an aggregate derived from the lower lithophysal unit (Tptpll). Contrary to Ron's email below, it is not "crushed invert," which I think he took as crushed cement??? The design invert is now a crushed aggregate of the rock removed during the tunneling process. The average of about half a dozen DOE measurements was 0.15 W/m-K for the Tptpll aggregate, which should be taken as the dry thermal conductivity. The thermal conductivity of intact lower lithophysal, excluding the lithophysae, ranges from a dry value of 1.4 W/m-K to 2.1 W/m-K. These values are consistent with expected general trends for intact tuff versus tuff ground up into fragments. Of course the nature of the fragments play an important role in determining the thermal conductivity. With small fragments, or poorly sorted fragments, small average pore sizes, the effective thermal conductivity will be small (dominated by conduction). With large fragments (and large pore spaces), the effective thermal conductivity will be larger because of the combined effect of conduction, convection, and radiation. Unfortunately, the fragment sizes and distribution are poorly constrained. Ron Green's measurements were judged to be the best available, though in situ measurements in a scoria field (Connor et al.) supported lower estimates. Ron's measurements have been taken to represent mean values for the effective thermal conductivity of the rubble.

I have not seen how the value 0.23 W/m-K was derived in the Analysis for UCDF Waste Packages (May 2000) document.

Goodluck's argument is valid. I thought that spatial variability (and general uncertainty) could be mapped to different Monte Carlo realizations. However, it seems the suggestion is that average values for the repository should be sampled instead. Thus, removing both ends of the distribution would be required (the argument goes: remove low end of distribution because all of the repository for one realization should not use a low value that may only occur in 5 or 10 % of the repository; ditto for the high end).

--Randy

-----Original Message-----
From: Osvaldo Pensado [mailto:opensado@cnwra.swri.edu]
Sent: Wednesday, May 04, 2005 4:37 PM
To: 'Ron Green'; 'Budhi Sagar'; 'Goodluck Ofoegbu'
Cc: Sitakanta Mohanty; Randall Fedors
Subject: RE: thermal conductivity

Then, the lower bound proposed for the TPA computations (0.12 W/m-K) may not be representative of the drift rock.

Goodluck provided a valid criticism to my approach of removing the low end of the thermal conductivity distribution. He said I do not have a valid reason to remove the low end of the distribution while keeping the upper end (1 W/m-k). Why do I believe one end more than the other?

We should use a low value applicable to drift rock. Looking at the Design Analysis for UCDF Waste Packages (May 2000), thermal conductivities are as low as 0.23 W/m-k. Thermal conductivities of the rock exceed 1.5 in multiple instances.

Now, what do we do?

-----Original Message-----
From: Ron Green [mailto:rgreen@cnwra.swri.edu]
Sent: Wednesday, May 04, 2005 4:17 PM
To: Budhi Sagar; Osvaldo Pensado; Goodluck Ofoegbu
Subject: thermal conductivity

FYI from our lunchtime discussion. I spoke with Randy. The 0.12 W/m-K is for crushed invert material, not rock from the repository horizon (i.e., Tptpll).

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