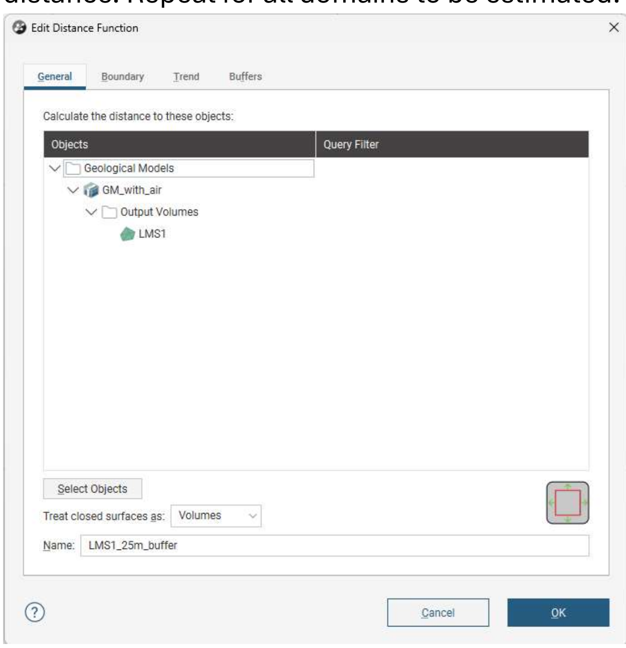
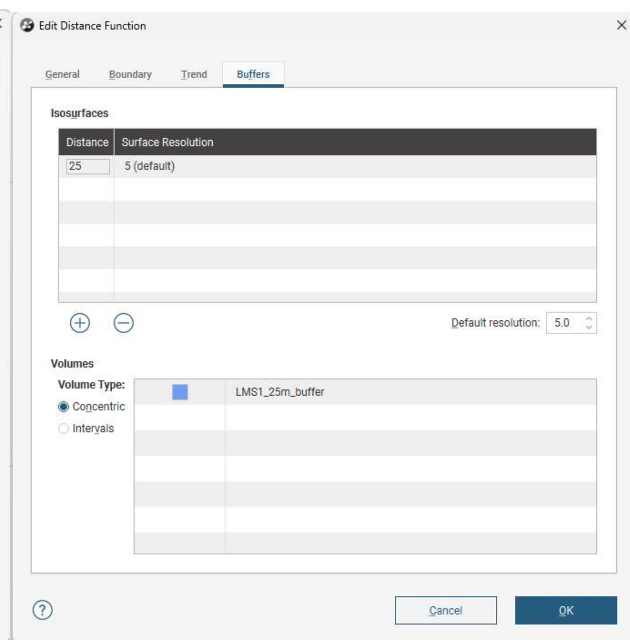
This workflow explains the process of creating percent models in Leapfrog Edge. Since Leapfrog uses volumes as the primary estimation domains, traditional percent models cannot be made since blocks that do not have a centroid inside the volume will not be estimated.

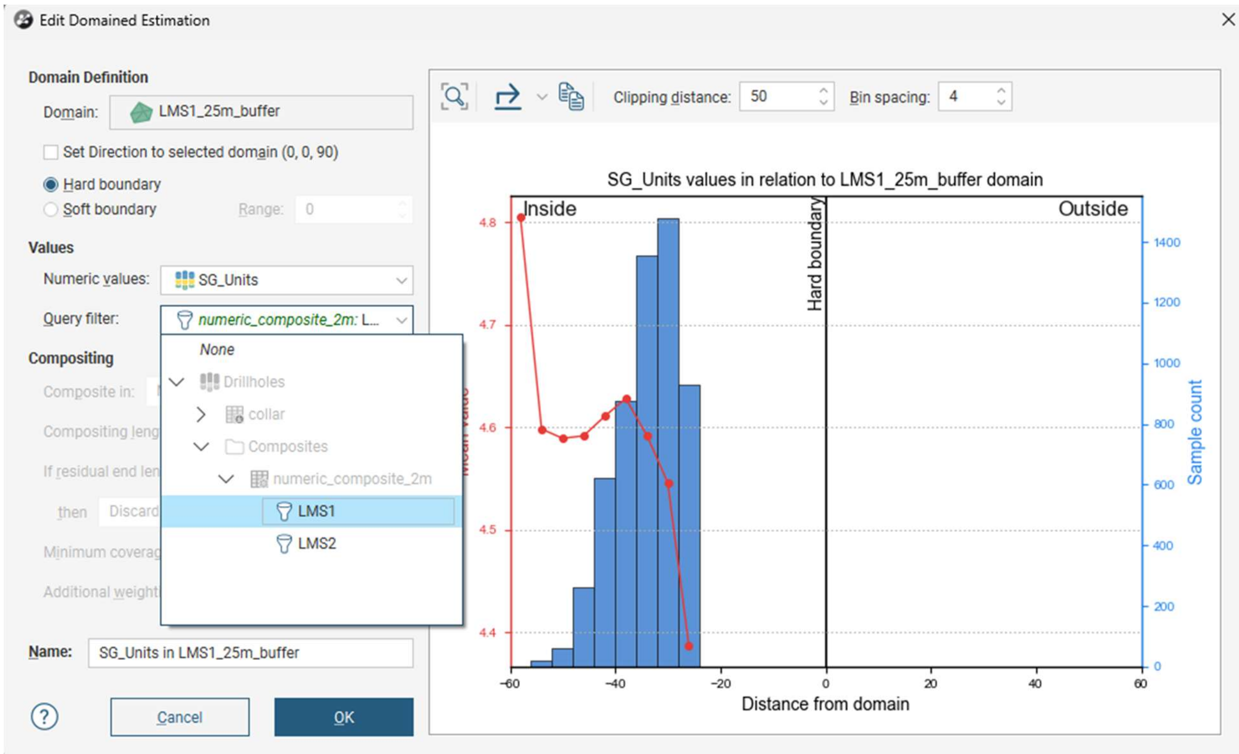
1) Create a regular block model that encompasses the area you are interested in.
2) If your deposit is to be mined in an underground operation, proceed to step 3. If your deposit is near-surface, and if not done so already, create a GM where you have Air as a lithology. This is important as Leapfrog does not consider information above topography for anything, but a regular block model will contain blocks that partially intersect the surface with centroids above. To enable the estimation/consideration of blocks that intersect topography:
    a. Open your copied GM, and on the Boundary tab, uncheck Use Topography
    b. On the Lithologies tab, create a new lith called Air
    c. In your Surface Chronology, add a new Erosion surface -> from surface and use your topo (which needs to be a mesh). Set the First Lithology to Air, and use contacts below. Move this surface to the top of your surface list and activate it. Doing so will create a new volume called Air.
3) Evaluate your GM (with Air) that contains your domains onto your regular block model and ensure the Proportions of each volume are also evaluated. This makes sure that all blocks will have a proportion.
4) Create a new Distance function for each of your domains (right-click Numeric Models -> New Distance Function). In the dialogue that opens, on the General tab, click on Select Objects and select your first domain volume. Next, on the buffers, create a single isosurface (recommend that the distance is at least 1 block), and give it a resolution about ¼ of the distance. Repeat for all domains to be estimated:





We create these buffer domains so that estimations can extend beyond their original domain volumes, thus estimating blocks that do not have centroids inside the original domain.

5) On your composites/input samples for your estimate, create a Query filter for each original domain if you intend on using hard boundaries. If you intend to use partially soft boundaries, create Query filters for those domains you want to have shared samples. These are made so that the samples from the original domains are used to estimate the buffer domains
6) Create new Estimation objects for each of the buffer domains. Set the appropriate analyte and enable the appropriate query filter from step 2:



7) Now that you have domained estimation objects for the buffer domains, you will need to determine if any of your original domains encounter the same blocks. If you're not sure, you can make a Filter in your block model called e.g. Overlap blocks that will show you blocks that have proportions of 2 or more domains:

```
Overlap blocks = ([LMS1 - Inside]> 0 and [LMS2 - Inside] >0)
```

   a. If your Original domains do not share blocks, proceed as normal and make variograms, variable orientation objects, estimators etc and combine estimators where necessary.
   b. If your Original domains do share blocks, proceed as normal **but** make sure your combined estimators (if doing multi-pass) and individual estimators (if doing single pass) are restricted to each buffer domain. This is because we will be writing 1 estimated value for each domain onto the same block (e.g. a block that contains 10% LMS1 and 20% LMS2 will have estimated grades for both LMS1 and LMS2)

Once complete, evaluate your estimators onto your regular block model.

8) Open up the Calculations for your regular model.

   a. Create “ore” tonnage calculations for each domain:

```
LMS1_tonnes = [LMS1 - Inside] * if ( is_normal([Kr, SG_Units in LMS1_25m_buffer]) → [Kr, SG_Units in LMS1_25m_buffer]
                                     otherwise → 4.55539 ) * [volume]
```

   b. Sum the “ore” tonnes:

```
Ore_tonnes = [LMS1_tonnes] + [LMS2_tonnes]
```

   c. Create a calculation for “waste” tonnes. This example uses fixed average densities for unmineralized rocks, but if you have estimated densities you can always use a calculation similar to 8a:

```
Waste_tonnes = ([MV - Inside] * 2.9 + [OB - Inside] * 2.5 + [Air - Inside]*0)*[volume]
```

   d. Calculate the final SG:

```
SG_final = ([Ore_tonnes] + [Waste_tonnes]) / [volume]
```

   e. Calculate the metal content of each domain. This will be unit-sensitive (in this example the units are percent):

```
LMS1_Zn_metal = if ( [LMS1_tonnes]>0 → if ( is_normal([Zn_per_LMS1_reg_no_clip]) → [Zn_per_LMS1_reg_no_clip]
                                            otherwise → 7 ) /100* [LMS1_tonnes]
                     otherwise → 0 )
```

   f. Sum the metal from all domains:

```
Zn_metal = [LMS1_Zn_metal]+ [LMS2_Zn_metal]
```

   g. Calculate the final diluted grade (again, this is unit-sensitive):

```
Zn_per_final = if ( [Ore_tonnes]= 0 → 0
                    otherwise → [Zn_metal]/([Ore_tonnes]+ [Waste_tonnes])*100 )
```

- Erik Scheel, Senior Project Geologist, Seequent