The NELAC Institute Presents

US GEOLOGICAL SURVEY LONG-TERM METHOD DETECTION LEVEL

LT-MDL – the USGS "MDL"

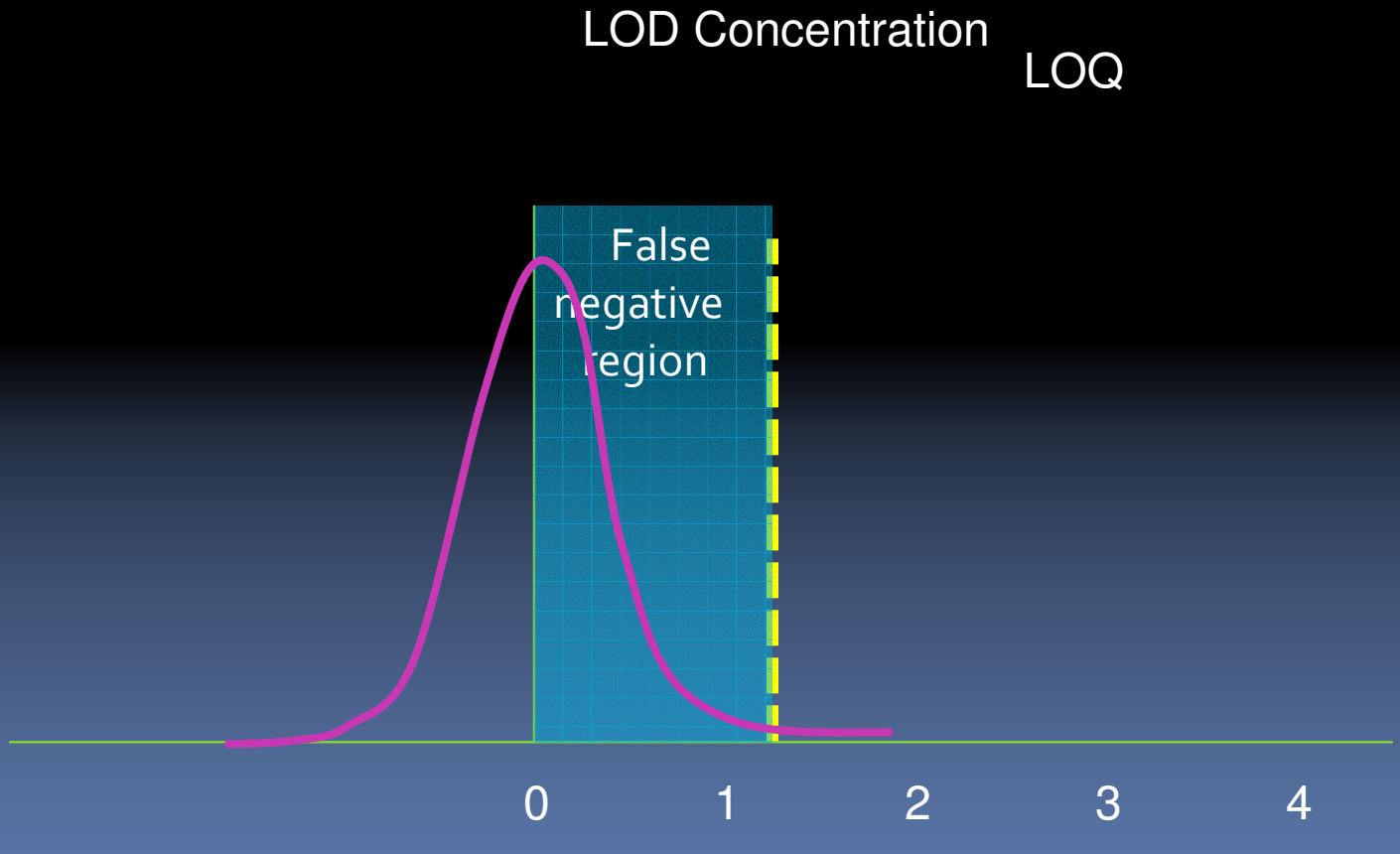
The long-term method detection level (LT-MDL) is based on EPA 40CFR Part 136 definition of the method detection limit (MDL).

It includes a more thorough capture of laboratory variability by continually collecting blind sample results – multiple analysts, multiple calibrations, multiple prep batches, multiple analytical batches.

LT-MDL

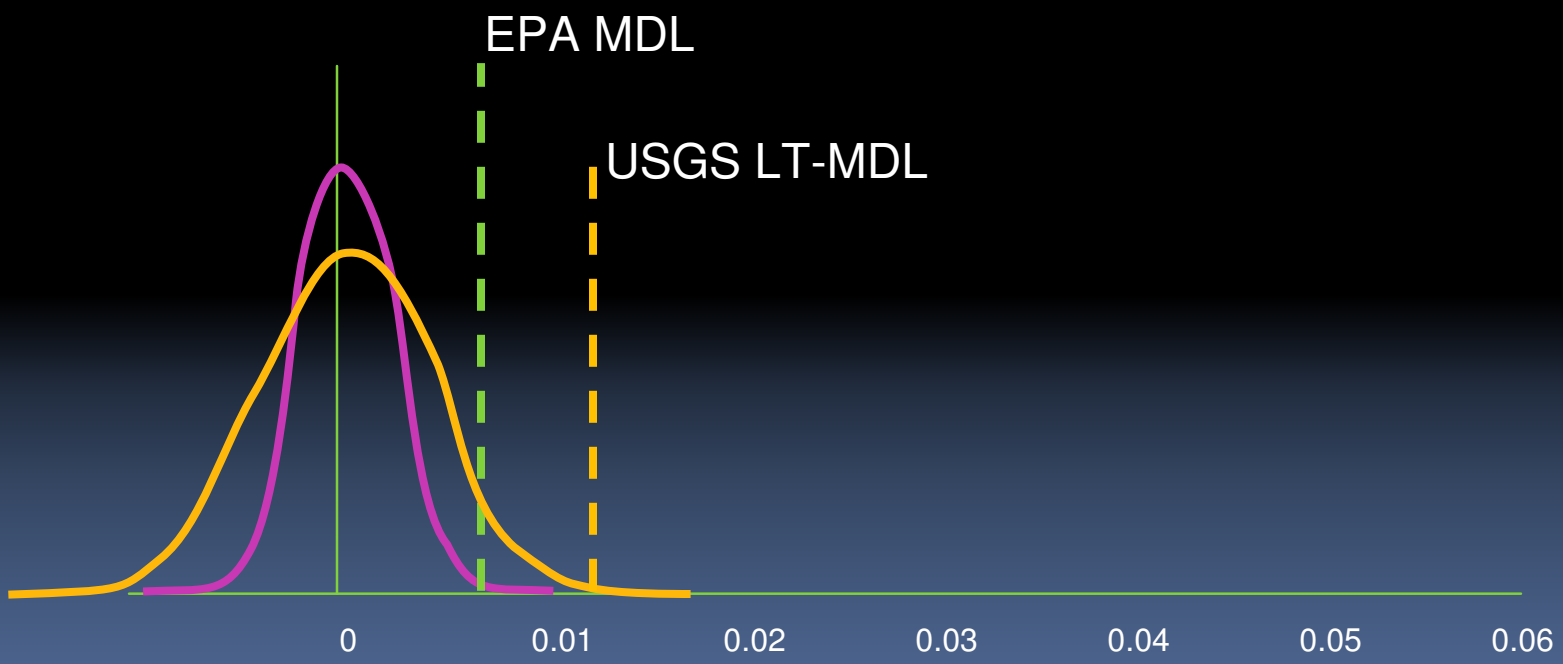
Goal is to limit F+ to <1%.

A second value was used for the reporting level because of the 50% false negative possibility at the LT-MDL concentration!



Finding the MDL

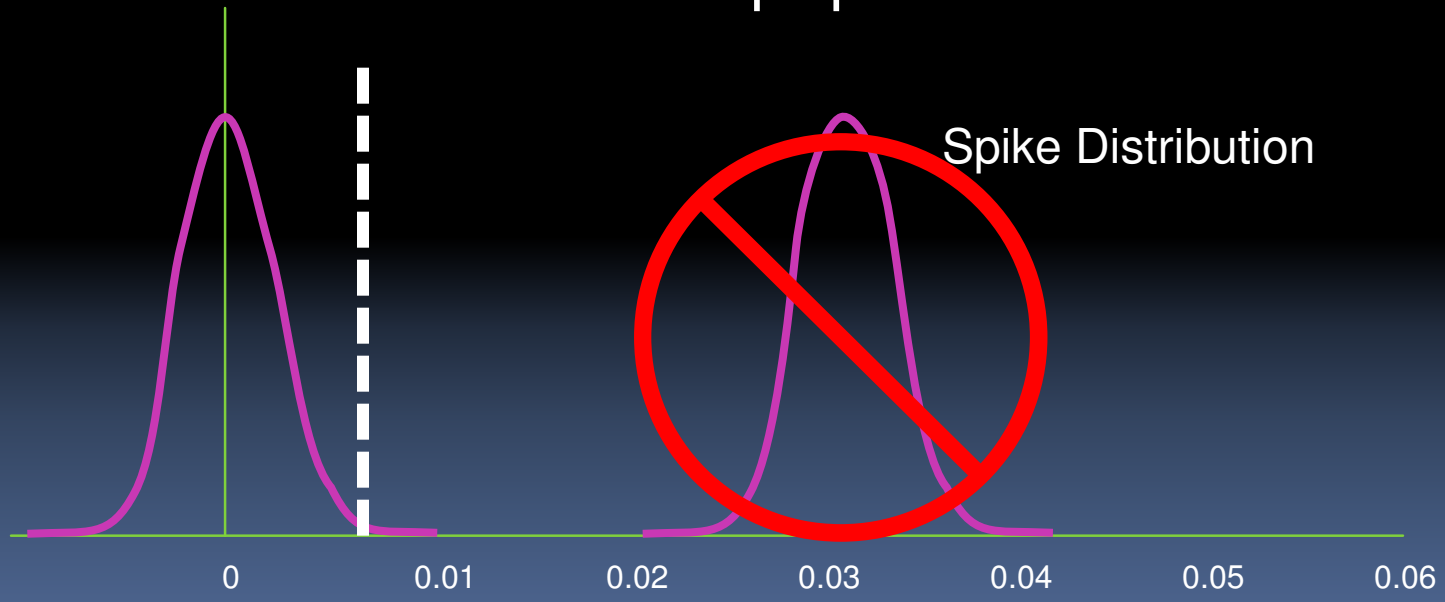
The USGS LT-MDL will typically be higher than the MDL because variability will be higher.



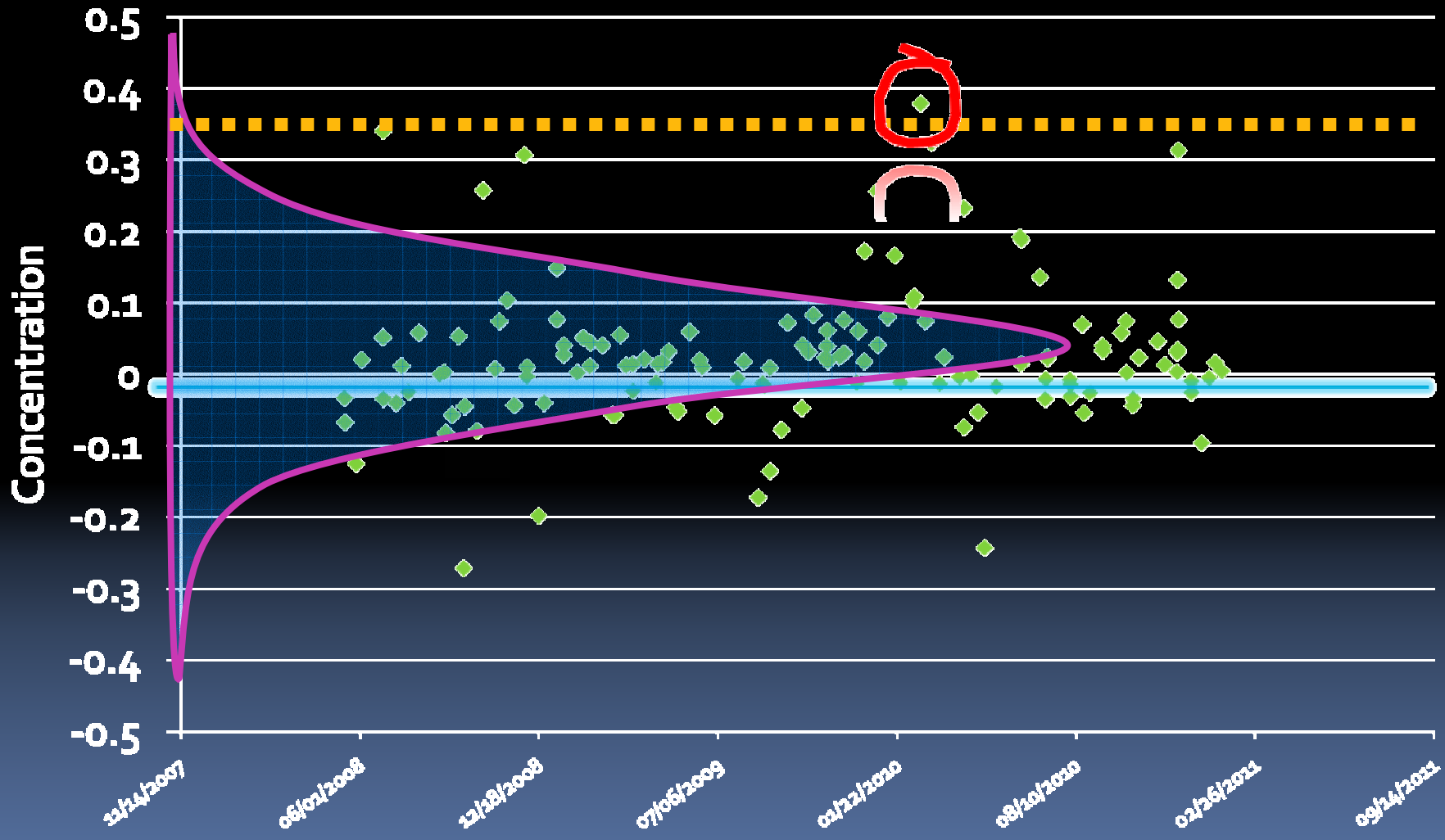
Finding the LT-MDL

USGS Procedure

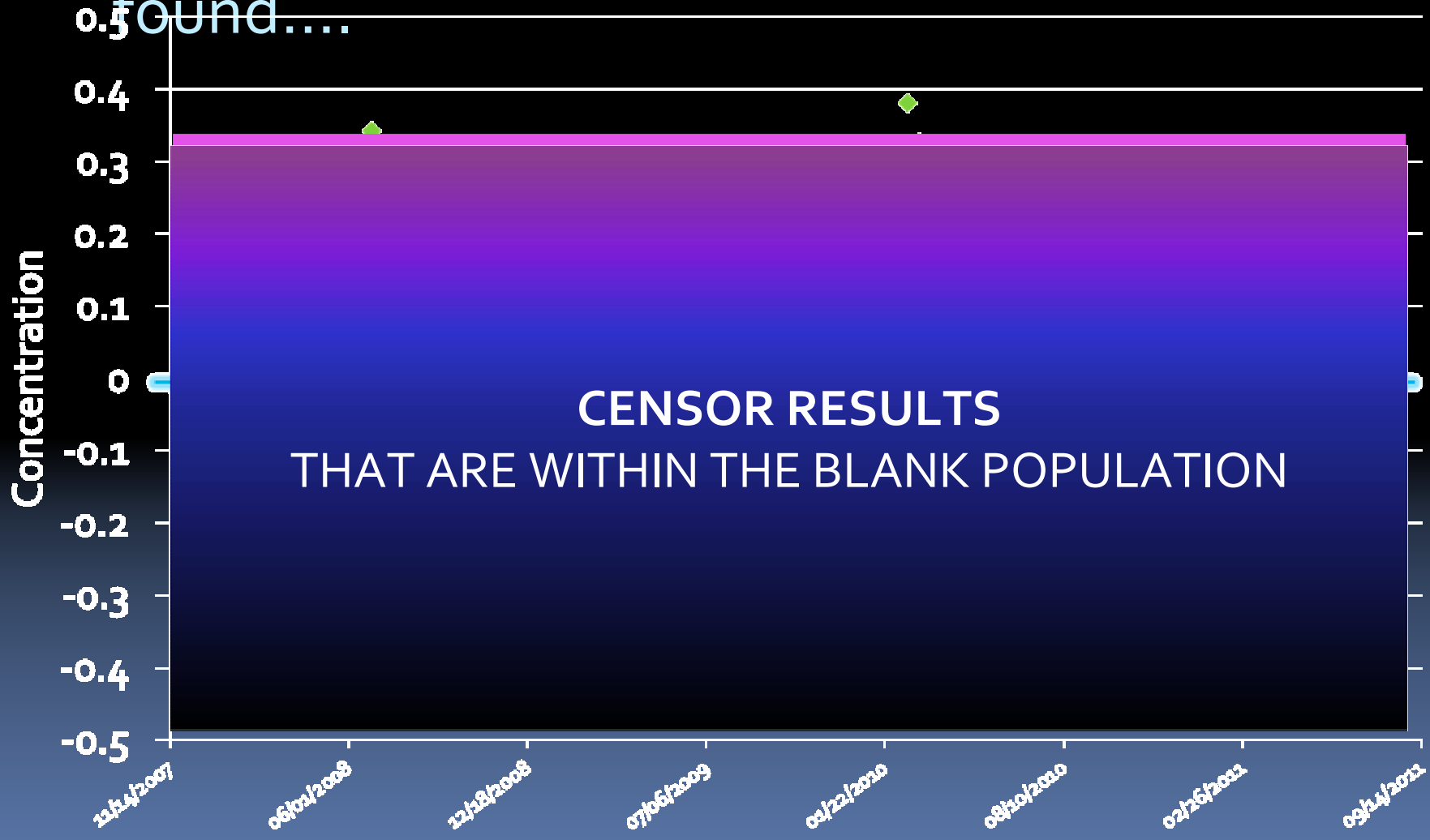
The best way to assess the blank population is to use the blank population.



Copper - 100 blanks

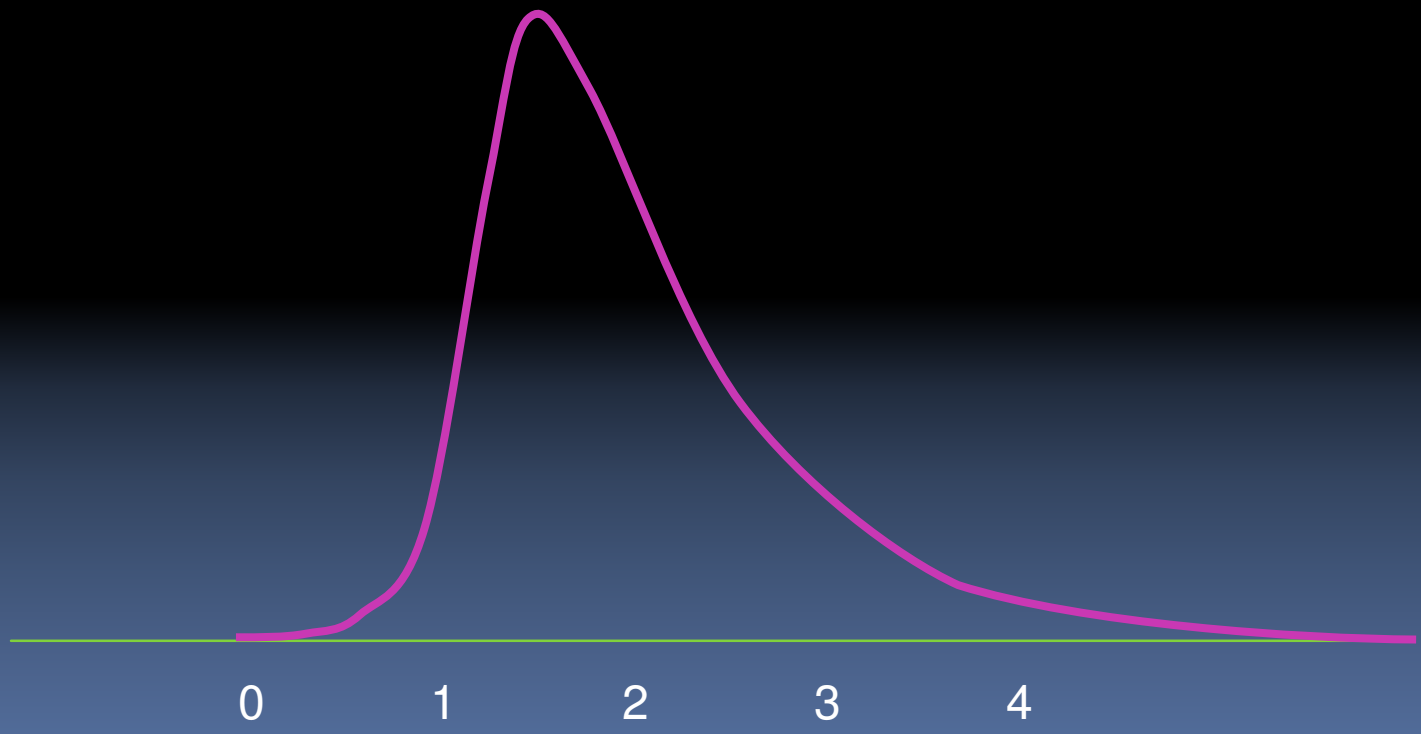


So find the concentration that represents where 1% or less of the blanks will be found….



Once upon a time, there was a Normal Distribution….

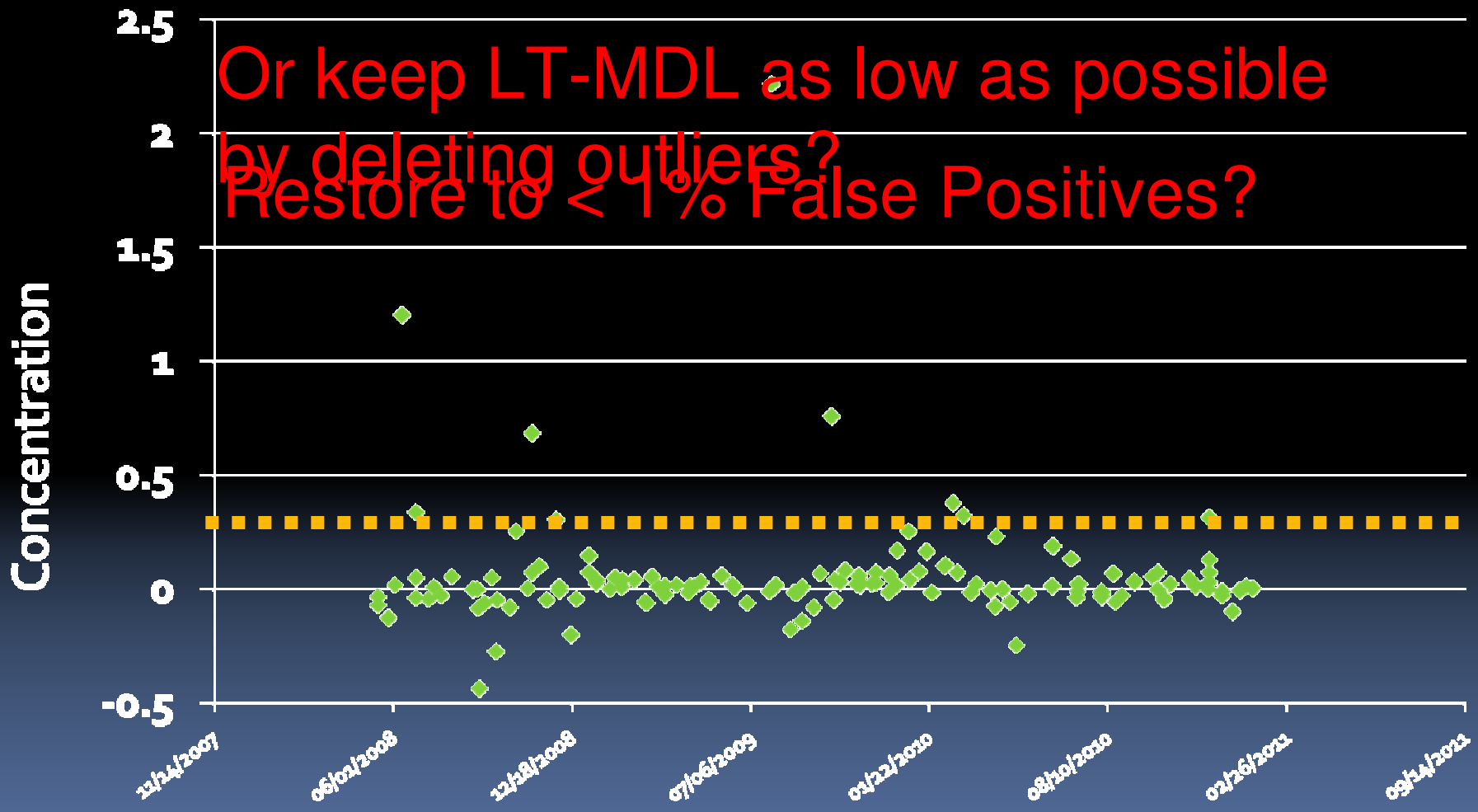
- The rest of the time, distributions were skewed, one sided, offset, and not always predictable.



Grubb's Test

- … removes the value which shows the largest absolute deviation from the mean if it exceeds a critical value…
- …one at a time…

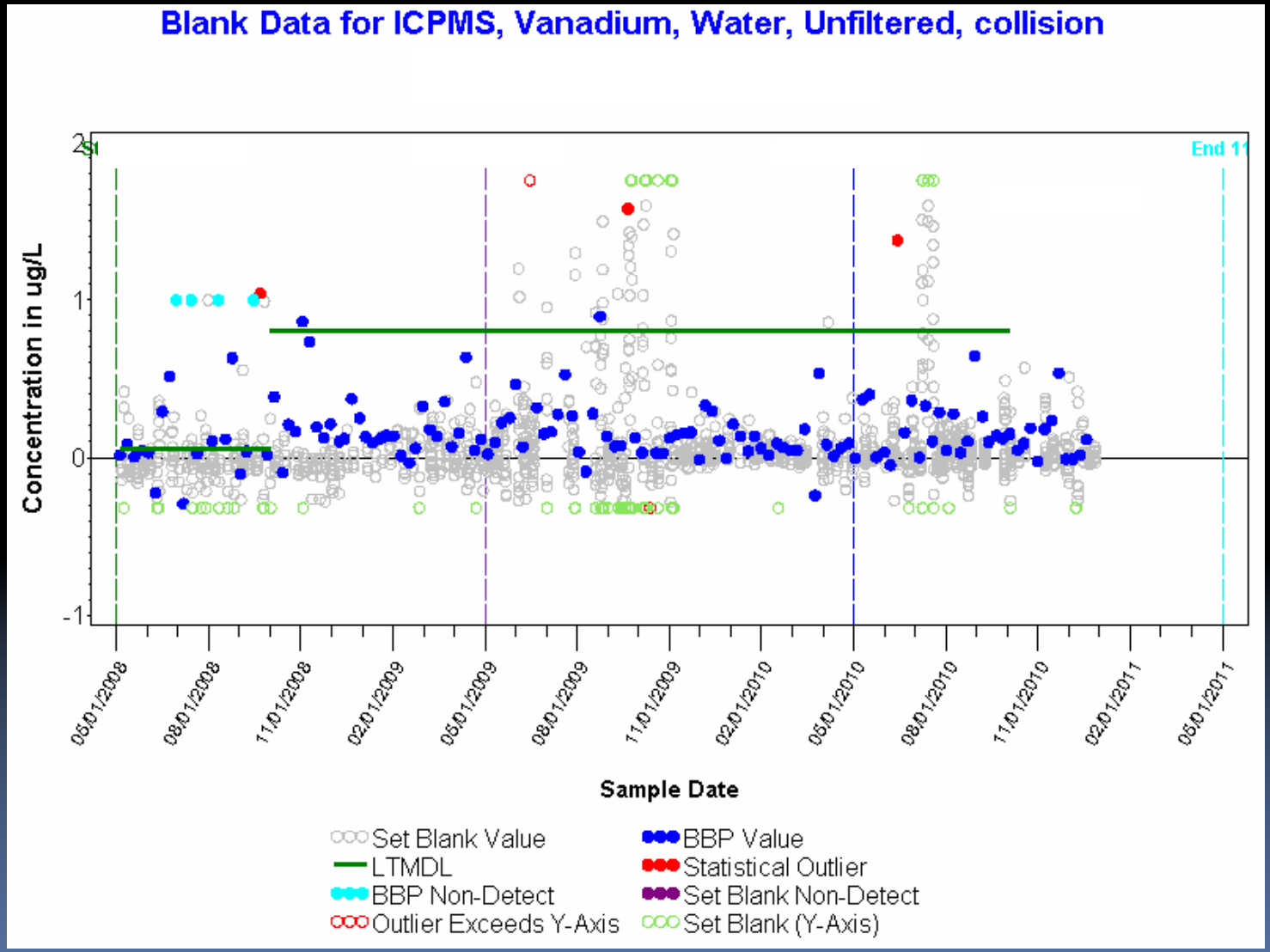
Copper - 104 blanks - with Outliers



Or keep LT-MDL as low as possible by deleting outliers?

Restore to < 1% False Positives?

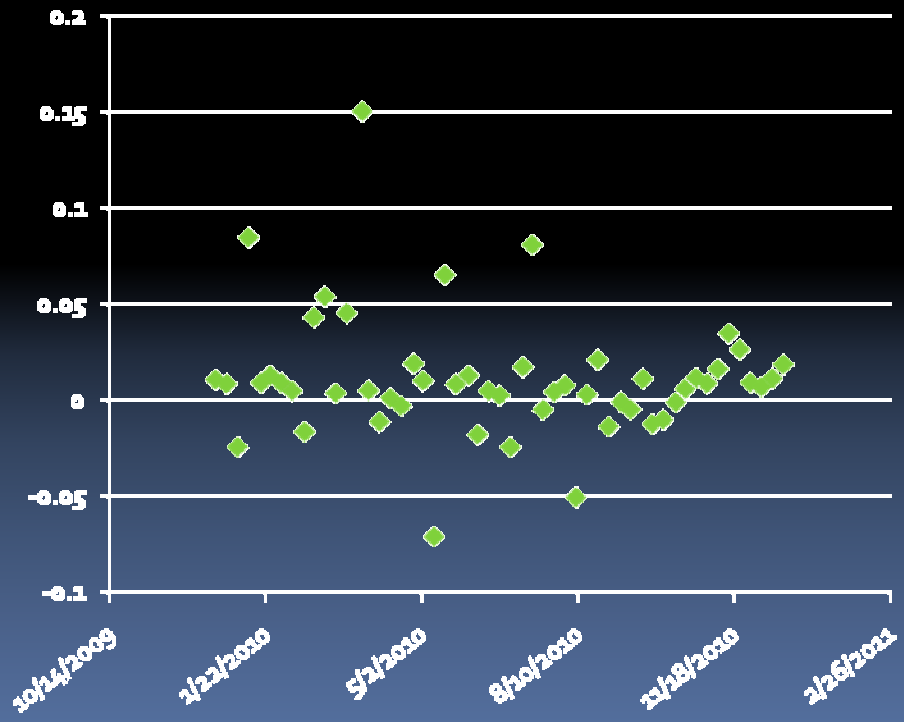
Set Blanks – Is the selected LT-MDL good?



LT-MDL allows for an alternate calculation of the LT-MDL for near normal distributions.

99th percentile (52 blind blanks per year)

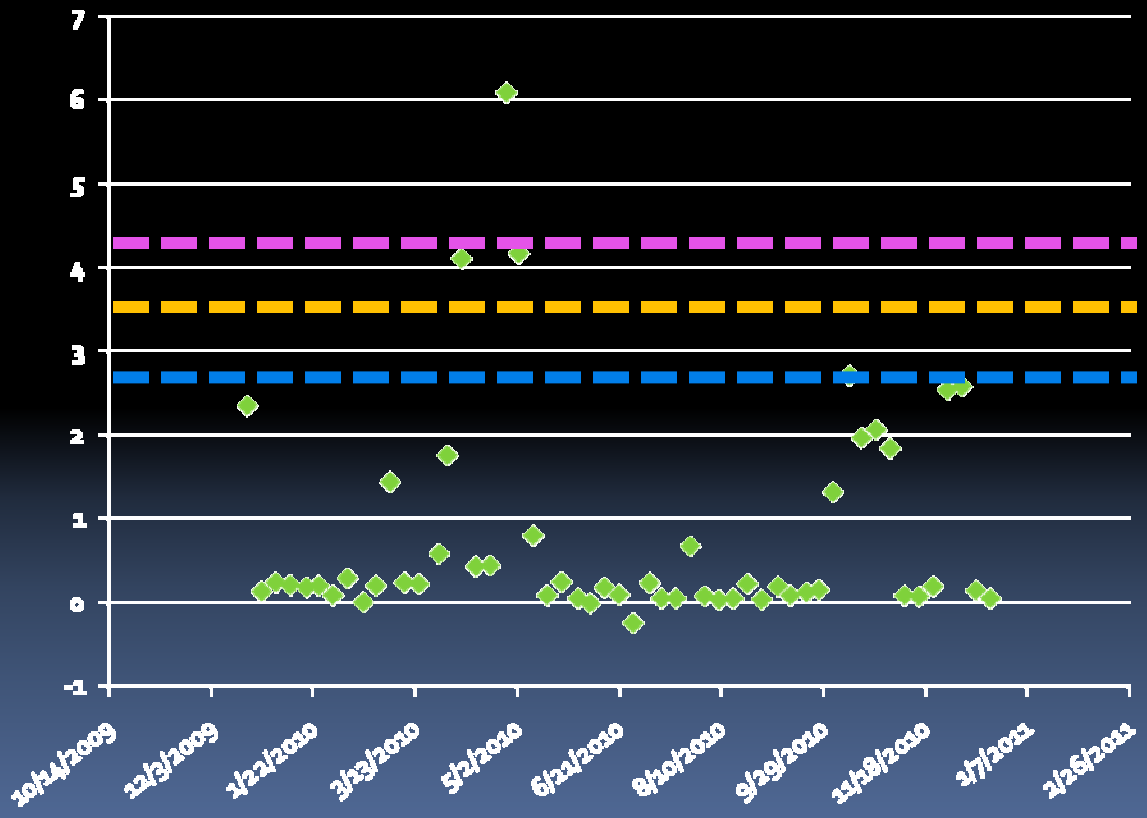
- ≈ 2nd highest ranked blank.



s x t =	0.088
2nd Highest Ranked =	0.085
Grubbed =	0.089

Hard to control contamination – non-normal

- Which LT-MDL value would you like??

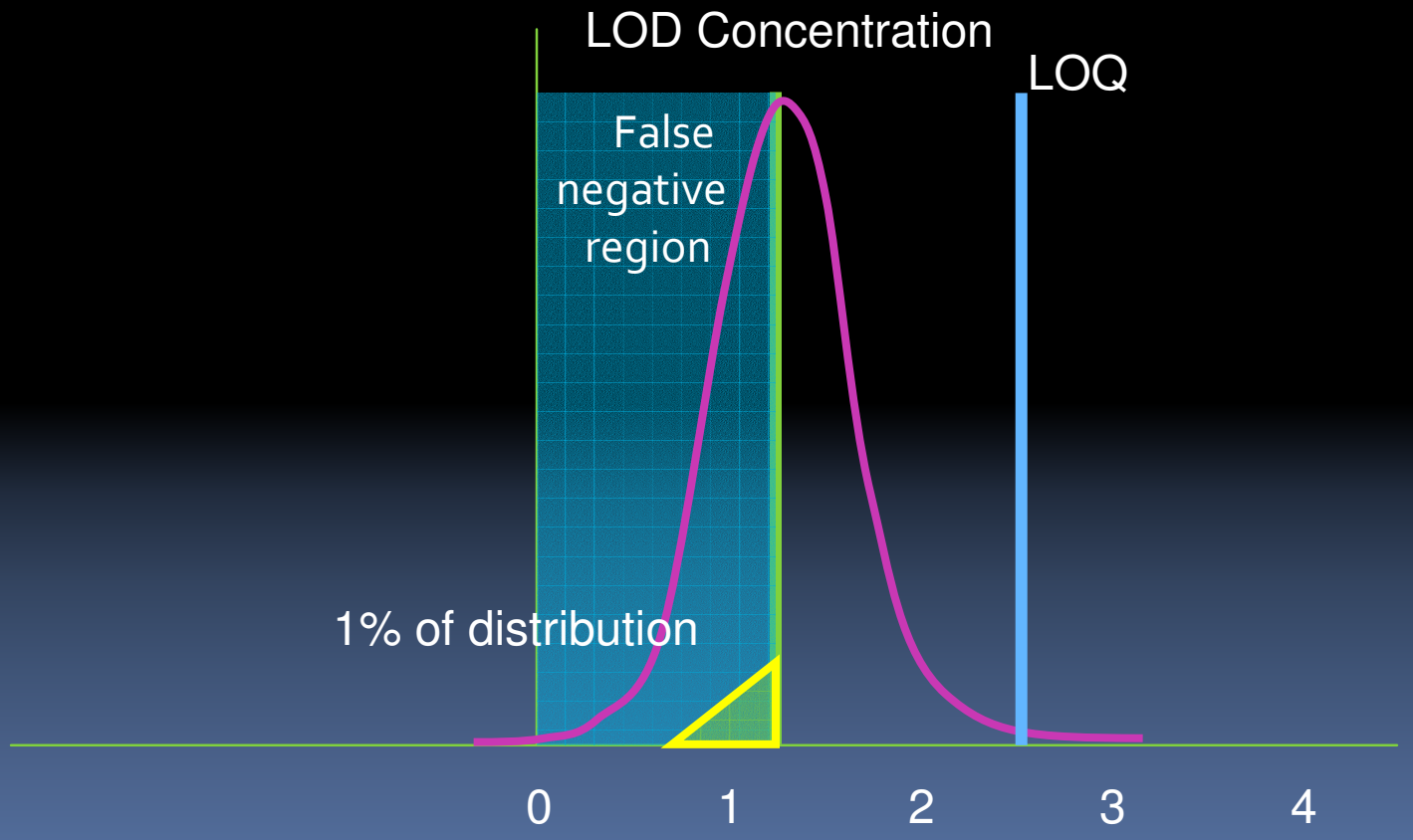


2nd Ranked = 4.17
s x t = 3.41
Grubbed = 2.81

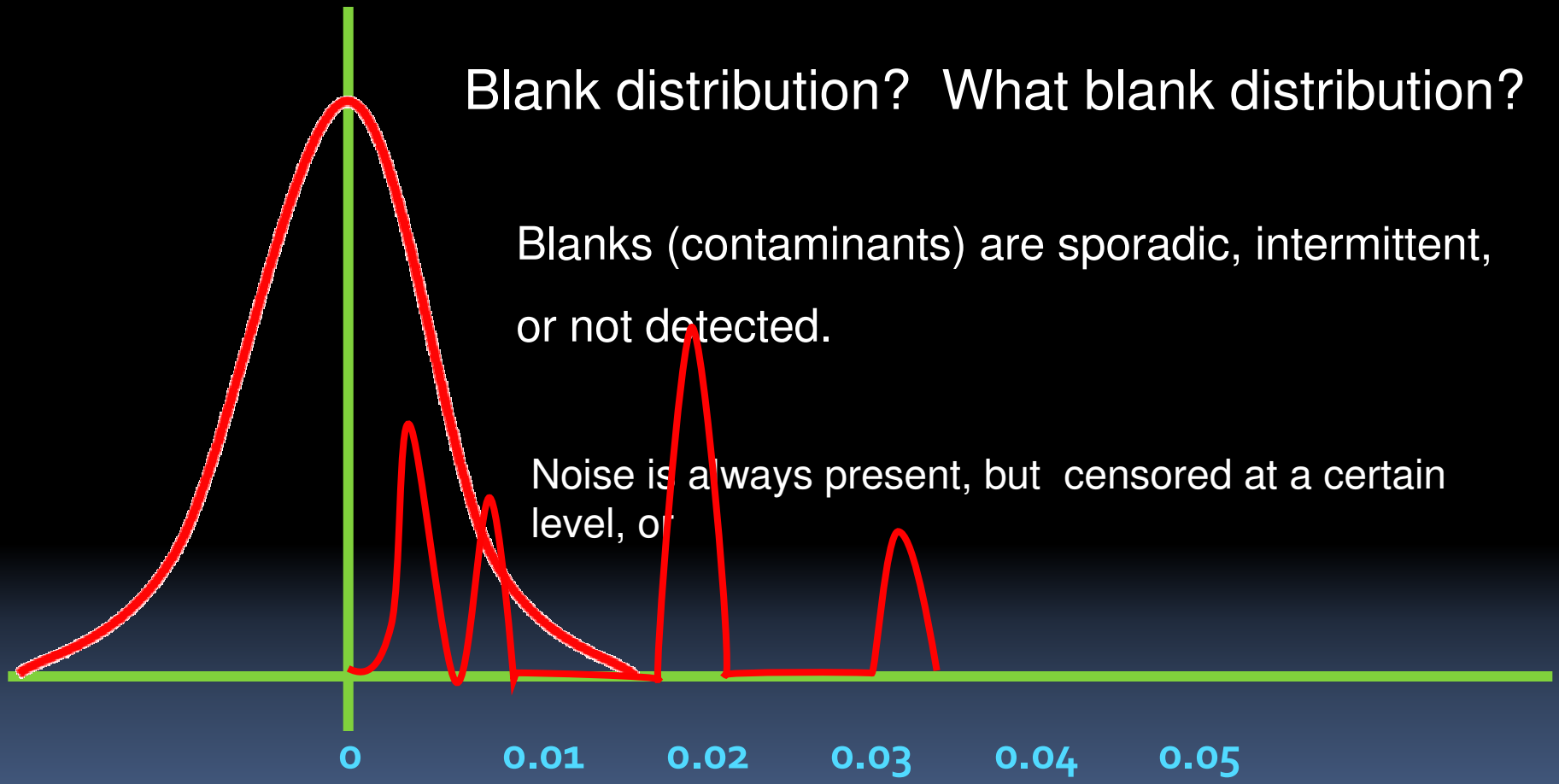
Censor more or err towards increased F+?

LOQ must be above LOD because…

To limit the false negatives to 1% or less, slide the distribution up until only 1% of the tail is in the false negative region. You can set the LOQ at any F- rate you want.



Organic GCMS Analyses….



Blank distribution? What blank distribution?

Blanks (contaminants) are sporadic, intermittent, or not detected.

Noise is always present, but censored at a certain level, or

USGS LT-MDL – Organic GCMS Methods

- Organic methods are more difficult
- All instrument signal is censored at an amount determined by the analyst, but I don't think is standardized by method.
- Noise IS distinguishable from analyte to a very low concentration, contamination is not.
- We are not looking for the blank population to avoid anymore, we are looking for sensitivity to a particular analyte.

LT-MDL for Organic GCMS…?

- Should it be measured by the least sensitive ion of the 3 required for identification?
- Should the ion selected for sensitivity be required to be some signal-to-noise factor?
- Does noise then need to be measured daily to verify detection capability?