perplexity

How high would an emissions disbursement stack have to be in if an aluminum recycling plant was set in a valley next to the river with an elevation out of the valley 670 foot to the west and over 1200 feet to the east with the valley being 20 miles wide and having only one river for runoff running through the valley.

An emissions disbursement stack for an aluminum recycling plant set in a valley with the geographic characteristics you've described would need to follow "Good Engineering Practice" (GEP) stack height guidelines to ensure the emissions disperse properly and meet air quality standards.

GEP stack height is calculated to prevent excessive concentrations of pollutants due to downwash, wakes, or eddy effects caused by terrain and nearby structures. The height is generally the greater of:

1. A minimum set height (commonly around 65 meters or approximately 213 feet) measured from the ground elevation at the base of the stack.
2. A formula-based height: Hg = H + 1.5L
    - Hg = GEP stack height
    - H = height of the nearby structure or terrain feature measured from the base of the stack
    - L = the lesser of the height or projected width of the nearby structure or terrain

Given your specific scenario:

- The valley floor is lower compared to the terrain on either side (670 feet elevation rise to the west, and over 1200 feet to the east).
- The valley is approximately 20 miles wide with a river running through it.

To accommodate this topography:

- The stack height should at least exceed the surrounding terrain height on the valley sides to allow emissions to disperse above the elevated terrain which creates potential for pollutant trapping.
- Practically, the stack height could be designed to be somewhat higher than the tallest adjacent terrain (i.e., over 1200 feet) or based on detailed dispersion modeling (fluid or field

studies) approved by regulatory authorities. This modeling accounts for the influence of the valley shape on airflow and pollutant dispersion.

- The 1.5L in the formula is generally applied to building or structure widths but when terrain features dominate, the terrain height is taken into account.

In conclusion, for the aluminum recycling plant in a 20-mile wide valley with surrounding terrain rises of 670 to over 1200 feet, the emissions stack would likely need to be at least on the order of **1200 feet or higher**, or a height derived from a site-specific air dispersion study ensuring emissions rise above the valley terrain to avoid pollutant accumulation. This would be confirmed by a regulatory field study or fluid model showing compliance with air quality standards.

Regulatory guidance generally refers to such practice and allows adjustments based on site-specific studies to optimize stack height for environmental safety[1] [2] [3] [4].

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1. https://www.epa.gov/sites/default/files/2018-07/documents/chapter_3745-16.pdf
2. https://des.sc.gov/sites/des/files/Library/Regulations/R.61-62.7.pdf
3. https://codelibrary.amlegal.com/codes/pimacounty/latest/pimacounty_az/0-0-0-12035
4. https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-51/subpart-G/section-51.118
5. https://ia.cpuc.ca.gov/environment/Attach 4_07-A Phase I ESAs.pdf
6. https://www.acgov.org/cda/planning/landuseprojects/documents/SMP-30-DEIR-Appendix-Complete-SCH-No 2011102051.pdf
7. https://www.codepublishing.com/CA/SantaCruzCounty/html/SantaCruzCounty13/SantaCruzCounty1310.html
8. https://www.muni.org/departments/sws/documents/final sws iswmp - november 2019.pdf
9. https://www.epa.gov/sites/default/files/2020-09/documents/gep.pdf
10. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P10178RN.TXT