

Appendix 6.2

Stack Height Determination

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6.1.1 Stack height sensitivity testing was undertaken using Cwm Level Park meteorological data from 2012 to 2016 with the maximum ground-level concentrations predicted across a grid of receptors with a model resolution of 30 m.

6.1.2 Dispersion model runs were undertaken for various stack heights between 20 m and 50 m with the stack height models in 2 metre incremental heights within this range. Table and the associated Figure A6-1 to Figure A6.3 show the results of the stack height sensitivity testing. The appropriate stack height was determined as the point at which the change in maximum predicted annual and 99.79th percentile NO₂ concentrations with each stack increase ceased to be significant. When plotted as a graph this is the point at which the curve flattens of after an initial rapid decrease with each increase in stack height.

Table A6-1: Maximum NO₂ Concentrations Predicted over the 30 m Resolution Models Receptor Grid for each Stack Height

Stack Height	Maximum Annual NO ₂		Maximum Hourly 99.79 th %ile NO ₂		Maximum Rolling 8 Hour CO	
	Predicted Contribution (µg/m ³)	As a % of the AQS objective	Predicted Contribution (µg/m ³)	As a % of the AQS objective	Predicted Contribution (µg/m ³)	As a % of the AQS objective
20	3.44	8.6%	260.8	130.4%	1381	13.8%
22	2.10	5.3%	194.2	97.1%	993	9.9%
24	1.22	3.1%	131.7	65.8%	658	6.6%
26	0.67	1.7%	81.9	40.9%	399	4.0%
28	0.34	0.9%	46.0	23.0%	220	2.2%
30	0.16	0.4%	23.3	11.6%	110	1.1%
32	0.09	0.2%	10.5	5.3%	63	0.6%
34	0.08	0.2%	6.2	3.1%	52	0.5%
36	0.08	0.2%	5.8	2.9%	45	0.4%
38	0.07	0.2%	5.5	2.7%	39	0.4%
40	0.07	0.2%	5.1	2.6%	34	0.3%
42	0.06	0.2%	4.8	2.4%	32	0.3%
44	0.06	0.2%	4.4	2.2%	30	0.3%
46	0.06	0.1%	4.2	2.1%	29	0.3%
48	0.05	0.1%	4.0	2.0%	27	0.3%
50	0.05	0.1%	3.8	1.9%	25	0.3%

Note: Annual mean NO₂ AQS objective 40 µg/m³, daily 99.79th percentile NO₂ AQS objective 200 µg/m³, CO 8 hour running 10,000 µg/m³.

- 6.1.3 Significant benefits are seen as the stack height increases from 20 m to 32 m, in terms of maximum ground level concentrations of NO₂ (both annual and 99.79th percentile hourly concentrations) and CO, as the impacts of building downwash reduce. Beyond this height, there is only a slight benefit seen, in terms of maximum ground level concentrations, with increasing stack height further, though there is a further decrease between 32 and 34 m when looking at 99.79th percentile hourly NO₂ concentrations though this also flattens out after 34 m. The continuing small decrease in maximum concentrations above 32/34 m is driven by the fact that with each stack increase the plume disperses slightly more before reaching ground-level, however, as these changes above 34 m are so small this indicates that the dispersion is no longer influenced by building downwash. When the stack height is increased to 34 m, the maximum impact on ground level concentrations of nitrogen dioxide is less than 1% of the annual mean objective and both NO₂ and CO are well below 10% of their relevant short-term AQS objectives.
- 6.1.4 A minimum stack height of 35 m has been proposed by APL for the Power Generation Plant and a maximum height of 45 m. The assessment of impacts at both human health and ecological receptors has, therefore, used a stack height of 35 m as this represents the worst-case in terms of dispersion. For other disciplines the maximum stack height of 45 m has been assumed as this represents a worst-case e.g. in terms of landscape and visual impacts etc.

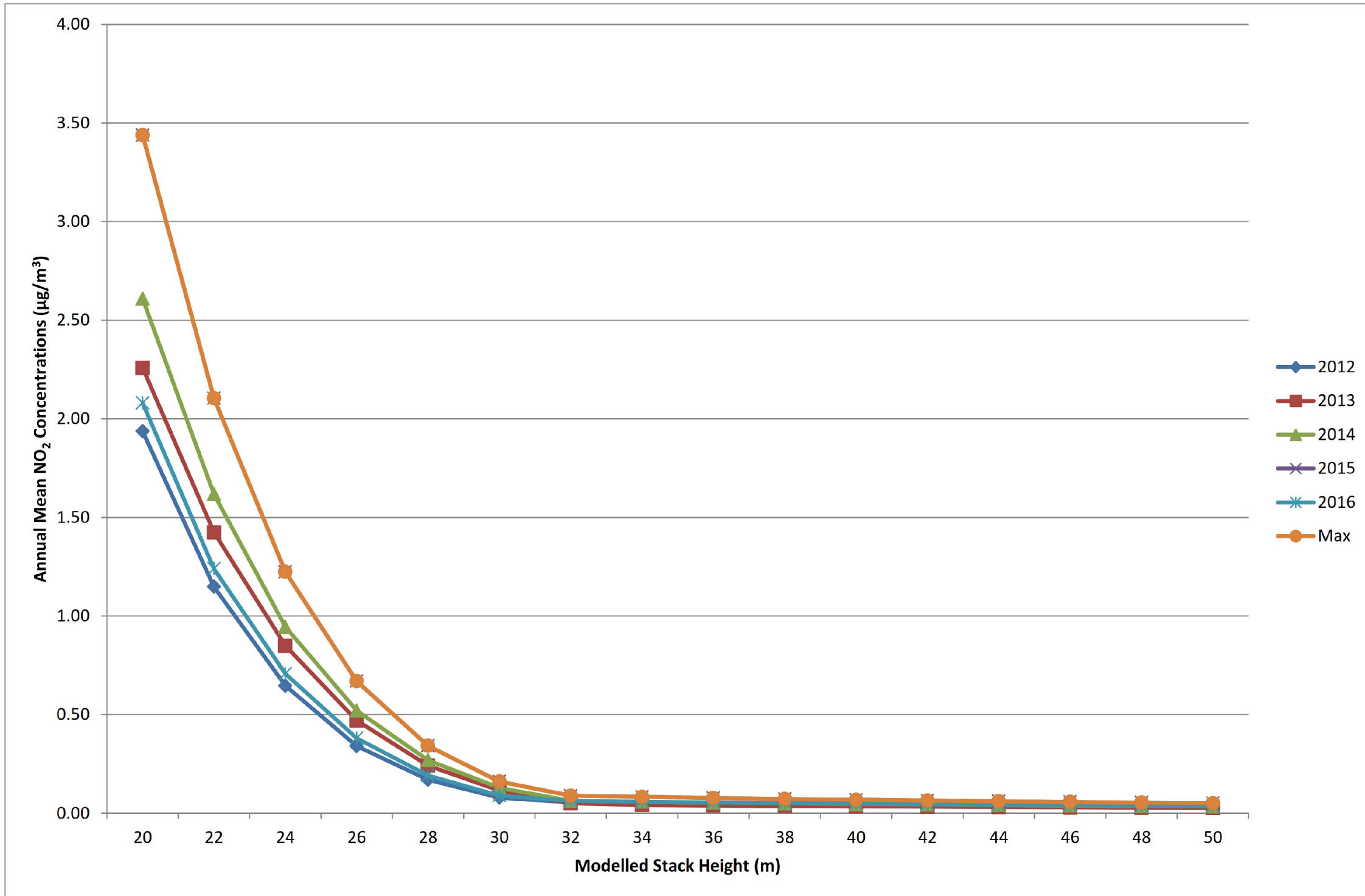
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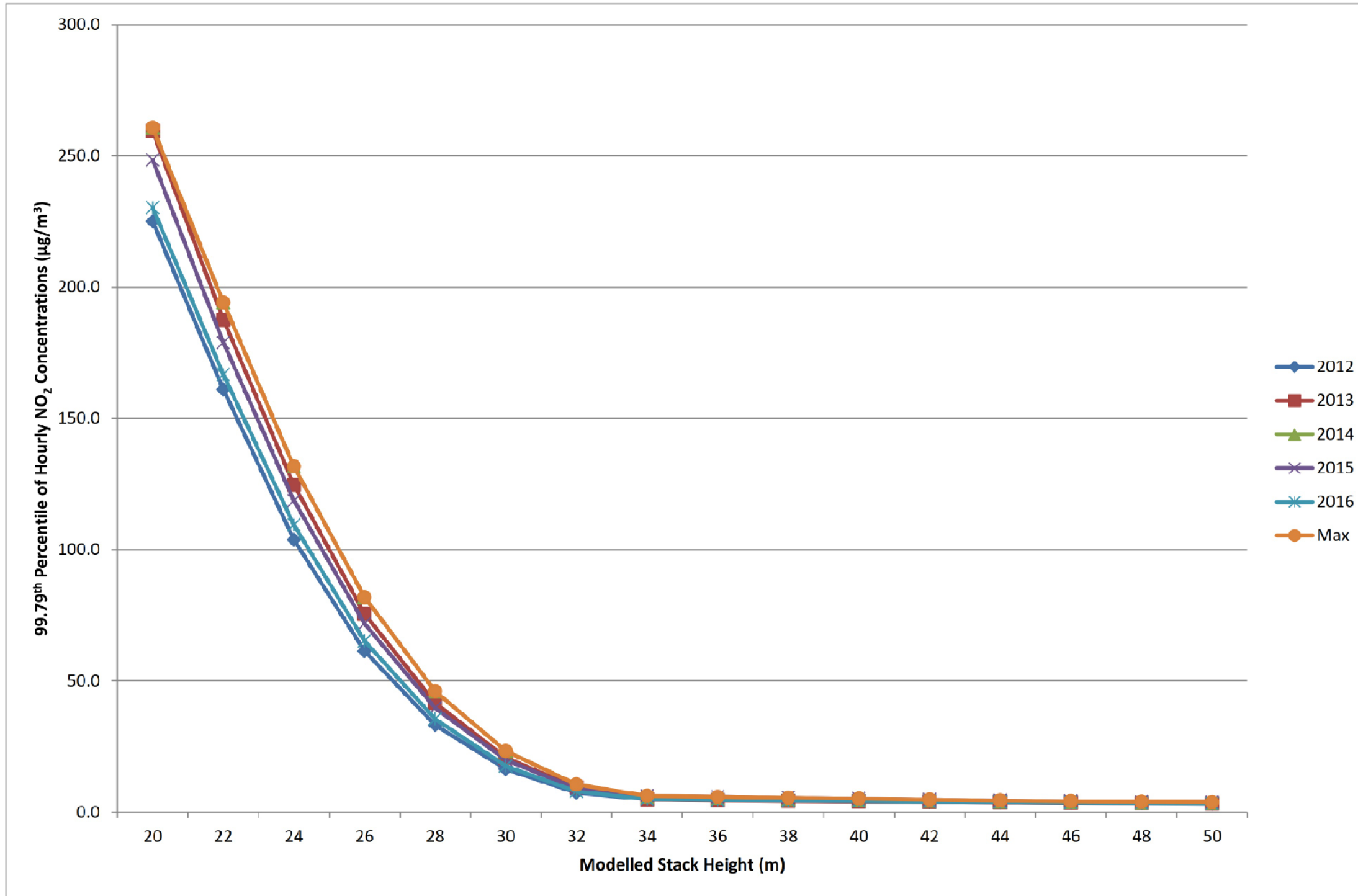
**STACK HEIGHT GRAPH
 ANNUAL MEAN
 NITROGEN DIOXIDE**

Scale at A3: Not to Scale

Drawing No: FIGURE A6.1 **Rev:** 002

Drawn: GM **Chk'd:** CC **App'd:** CA **Date:** 24/11/17

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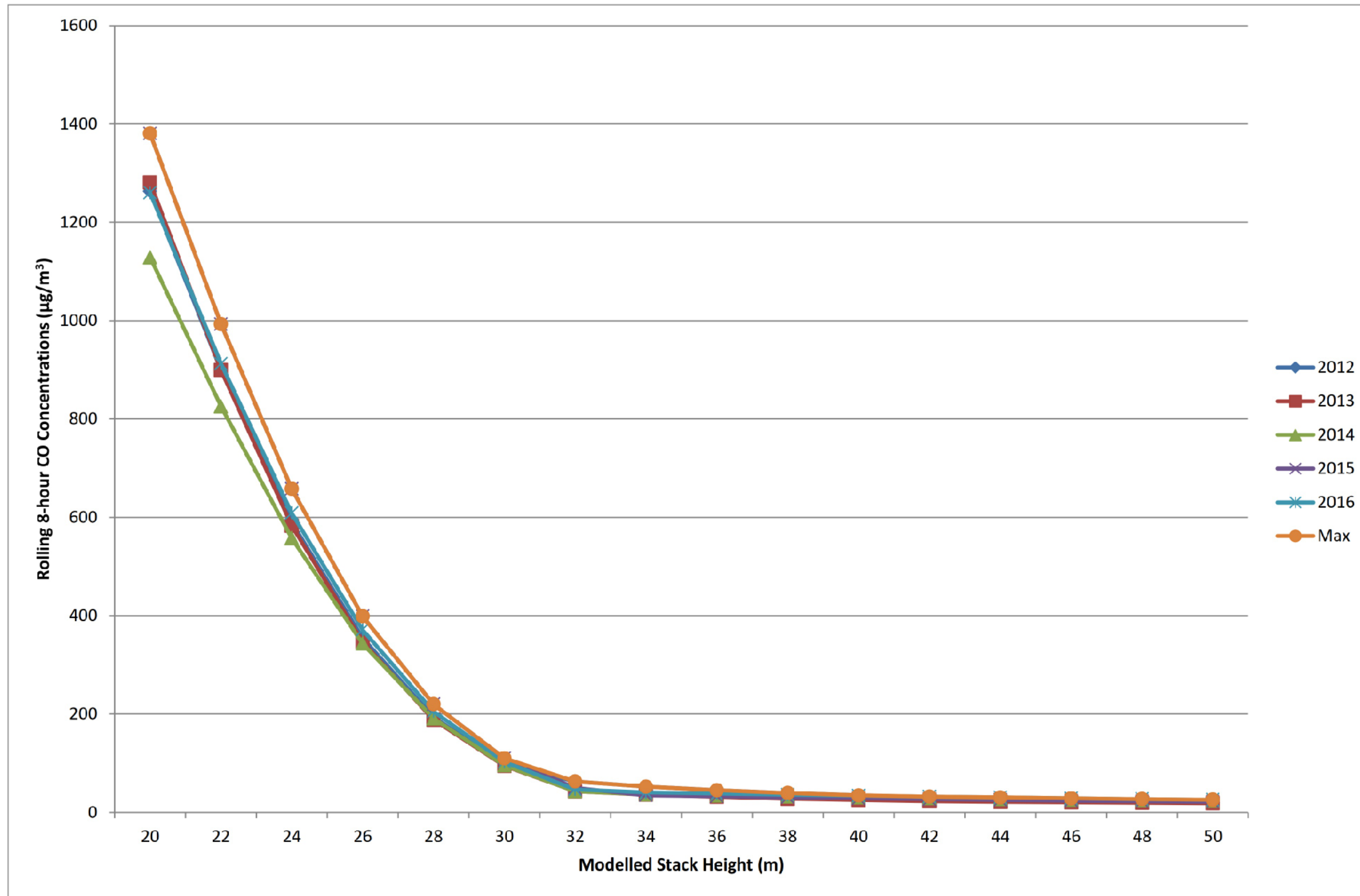
STACK HEIGHT GRAPH
 HOURLY MEAN
 NITROGEN DIOXIDE

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**STACK HEIGHT GRAPH
 ROLLING 8-HOUR CO**

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