

MYRSKY ENERGIA OY

Pilpänkankaan tuulivoimahanke

Melu- ja varjostusmallinnusraportti

27.11.2024

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Pilpankankaan tuulivoimahanke

1 MELU- JA VARJOSTUSMALLINNUKSEN TAVOITTEET

Pilpankankaan tuulivoimahankkeen hankeomistaja Myrsky Energia Oy suunnittelee hankevaihtoehdossa 1 (VE1) 30 voimalan rakentamista, vaihtoehdossa 2 (VE2) 24 voimalan ja vaihtoehdossa 3 (VE3) 14 voimalan rakentamista Pyhännän kuntaan Iso Lamujärven eteläpuolelle. Tämä melu- ja varjostusmallinnusraportti on laadittu Pilpankankaan tuulivoimahankkeen YVA-menettelyvaiheen sijoitus-suunnitelmien perusteella.

Tuulivoimaloiden aiheuttamia meluvaikutuksia on arvioitu WindPRO-ohjelman DECIBEL-moduulilla. Tuulivoimaloiden aiheuttamat varjostusvaikutukset on mallinnettu WindPro-ohjelman SHADOW-moduulilla. Melu- ja varjostusmallinnukset on laatinut ins. (AMK) Aarni Nikkola ja laaduntarkastuksen on tehnyt ins. (AMK) Henna-Riikka Rintamäki FCG Finnish Consulting Group Oy:stä.

2 LÄHTÖTIEDOT JA MENETELMÄT

2.1 Melu

2.1.1 Melumallinnus ISO 9613-2

Tuulivoimaloiden aiheuttamat äänenpainetasot on mallinnettu WindPRO-laskentaohjelman Decibel-moduulilla ISO 9613-2 standardin mukaisesti. Ympäristöhallinnon tuulivoimaloiden melun mallintamista koskevan ohjeen 2/2014 mukaisesti tuulen nopeutena käytettiin 10 m korkeudella mitattuna 8 m/s, ilman lämpötilana 15 °C, ilmanpaineena 101,325 kPa, ilman suhteellisenä kosteutena 70 % ja maanpinnan kovuutena arvoa 0,4. Laskenta on tehty 4,0 m maan pinnan tasosta.

Pilpankankaan tuulivoimaloiden äänenpainetasot on mallinnettu kaikissa vaihtoehdoissa voimalaitostyyppillä Generic RD200-7.2 MW, jonka napakorkeus on 200 metriä ja roottorinhalkaisija 200 metriä. Voimaloiden kokonaiskorkeus on näin ollen 300 metriä ja teho enimmillään 7,2 MW.

Voimalaitoksen Generic RD200-7.2MW lähtömelutaso on 106,9 dB(A). Melun lähtöarvot perustuvat Vestas V172-7.2 MW voimalamallin meluspektriin. Voimalaitoksen lähtömelutaso L_{WA} on 106,9 dB(A), mikä on voimalan valmistajan antama takuuarvo, kun voimalassa käytetään ääntä vaimentavaa siipityyppiä (Taulukko 1). Hankevastaavan pyynnöstä lähtömelutasoon on lisätty 2 dB(A) varmuusarvo, jolloin lähtömelutasoksi muodostuu 108,9 dB(A).

Pilpankankaan tuulivoimahankkeen yhteisvaikutuksia tarkastellessa otettiin huomioon läheiset Konnunsuon, Lapinsalon ja Hautakankaan tuulivoimahankkeiden voimalat.

Melumallinnusten laskentatuloksia on havainnollistettu ns. keskiäänitasokarttojen avulla. Keskiäänitasokartoissa on melun keskiäänitaso- eli ekvivalenttiäänitasokäyrät (L_{Aeq}) 5 dB välein.

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Taulukko 1. Pilpankankaan tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot voimalaitoksella Generic RD200–7.2 MW sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT							
Mallinnusohjelma ja versio:				Mallinnusmenetelmä:			
WindPRO version 3.6.355				ISO 9613-2			
TUULIVOIMALAN TIEDOT							
Tuulivoimalan valmistaja: Generic				Tyyppi: Generic RD200–7.2 MW		Sarjanumero/t: -	
Nimellisteho: 7,2 MW		Napakorkeus: 200 m		Roottorin halkaisija: 200 m		Tornin tyyppi: teräs/hybridi	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	- dB	Kyllä	- dB	Noise mode säätö: PO7200, STE			
Ei		Ei		Noise mode, lähtömelutaso		106,9 dB	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Vestas V172-7.2MW Third Octaves. Asiakirja nro: 0128-4336_00, 30.6.2022 (Original instruction T05 0128-4336 VER 00)							
Taulukossa esitetään mallinnuksessa käytetty melupäästö varmuusarvoineen (+ 2,0 dB(A))							
Oktaaveittain [Hz],dB(A)		1/3-oktaaveittain [Hz] LWA dB					
		20	63,7	200	98	1600	94,4
63	92,4	25	68,9	250	98,6	2000	92,4
125	100	31,5	73,8	315	98,8	2500	90,1
250	103,3	40	78,6	400	98,9	3150	87,5
500	103,5	50	83	500	98,7	4000	84,5
1000	101,9	63	86,8	630	98,6	5000	81,1
2000	97,4	80	90,2	800	98,1	6300	77,4
4000	89,9	100	92,9	1000	97,2	8000	73,3
8000	79,2	125	95,2	1250	95,9	10000	68,9
LWA,tot =108,9 dB(A)		160	96,8				
Melun erityispiirteiden mittausta ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudi-modulaatio)		Muu, Mikä:	
kyllä	ei	kyllä	ei	kyllä	ei	kyllä	ei

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Taulukko 2. Konnunsuon tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT							
Mallinnusohjelma ja versio:				Mallinnusmenetelmä: ISO 9613-2			
WindPRO version 3.6.355							
TUULIVOIMALOIDEN TIEDOT							
Tuulivoimalan valmistaja: Siemens Gamesa (SG)				Tyyppi: SG 6.6-170		Sarjanumero/t:-	
Nimellisteho: 6,6 MW		Napakorkeus: 215 m		Roottorin halkaisija: 170 m		Tornin tyyppi: teräs/hybridi	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä:			
Kyllä	dB	Kyllä	dB	Noise mode säätö:			
Ei		Ei		Noise mode, lähtömelutaso		106 dB(A)	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
SG-F18.16-TR-00891_R00_Standard Acoustic Emission Document, SG 6.6-170, Rev. 0 Lähtömelutasoon on lisätty epävarmuusarvoksi 2 dB(A)							
Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz], dB(A)					
		12,5	57,2	125,0	90,2	1250,0	99,5
62,5	88,5	16,0	61,6	160,0	91,7	1600,0	99,3
125	95,4	20	65,7	200,0	92	2000,0	96,4
250	98,1	25	69,7	250,0	93,5	2500,0	94
500	99,9	31,5	73,7	315,0	94,1	3150,0	92,7
1000	103,8	40	77,5	400,0	93	4000,0	90,3
2000	101,9	50,0	80,3	500,0	94,8	5000,0	86,8
4000	95,3	63,0	83,1	630,0	96,8	6300,0	82,9
8000	85,0	80,0	85,9	800,0	98,1	8000,0	79,2
108 dB(A)		100,0	89,8	1000,0	99,3	10000	75,5
Melun erityispiirteiden mittaust ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudimodulaatio)		Muu, Mikä:	
kyllä	Ei	kyllä	Ei	kyllä	Ei	kyllä	Ei

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Taulukko 3. Lapinsalon tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT							
Mallinnusohjelma ja versio: WindPRO version 3.6.355				Mallinnusmenetelmä: ISO 9613-2			
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)							
Tuulivoimalan valmistaja: Nordex			Tyyppi: N163-6,8 MW			Sarjanumero/t: -	
Nimellisteho: 6.8 MW		Napakorkeus: 200 m		Roottorin halkaisija: 163 m		Tornin tyyppi: teräs/hybridi	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	- dB	Kyllä	- dB	Noise mode säätö: Mode 1, no STE		Kyllä	
Ei		Ei		Noise mode, lähtömelutaso		108,4 dB	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Third octave sound power levels N163/6.X, F008_277_A17_EN, revision 02, 2021-11-08 Valmistajan ilmoittama tuulivoimalan tuottama äänitehotaso vastaa keskiäänitasoa ja lisäämällä epävarmuus 1,5 dB(A) saadaan äänitehotaso vastaamaan takuuarvoa. Nordexin mukaan: <i>The warranted sound power levels are calculated expected mean values. This is common practise in the industry and also other OEMs are following the same approach. Within the Noise Emission Warranty Nordex warrants that a single measurement will be within the confidence interval according to IEC 61400-14.</i> <i>Please further be advised, that we limit the Confidence Interval according to the Noise Emission Warranty to a maximum value of 1.5dB(A).</i> <i>If you experience challenges in your noise emission calculations, please let us know and we could investigate further.</i> <i>Kind regards,</i> <i>Chris</i> Mallinnuksiin on lisätty 1,5 dB(A) epävarmuusarvo voimalaitoksen äänitehotasoihin. Mallinnuksissa on käytetty voimalamallia, jossa ei ole melua vaimentavaa sahalaistaa (serrated trailing edge).							
Oktaaveittain [Hz], dB(A)		1/3-oktaaveittain [Hz] LWA dB					
		20	75,8	200	95,8	1600	100,2
63	93,8	25	79,2	250	96,8	2000	98,1
125	98,6	31,5	81,1	315	97,9	2500	94,6
250	101,7	40	82,3	400	98	3150	90,2
500	103,2	50	84,5	500	98,1	4000	84,6
1000	104,8	63	88,8	630	99,2	5000	78,7
2000	103	80	91,3	800	99,7	6300	70,6
4000	91,5	100	91,9	1000	100	8000	61,9
8000	71,3	125	94,5	1250	100,4	10000	56,5
109,9 dB(A)		160	94,5				
Melun erityispiirteiden mittaustulos ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudi- modulaatio)		Muu, Mikä:	
kyllä	ei	kyllä	ei	kyllä	ei	kyllä	ei

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Taulukko 4. Hautakankaan tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden äänitehotasot sekä melun erityispiirteet.

MALLINNUSOHJELMAN TIEDOT							
Mallinnusohjelma ja versio:				Mallinnusmenetelmä:			
WindPRO version 3.6.355				ISO 9613-2			
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)							
Tuulivoimalan valmistaja: Nordex				Tyyppi: N163-5,7 MW		Sarjanumero/t:-	
Nimellisteho: 5.7 MW		Napakorkeus: 218,5 m		Roottorin halkaisija:163 m		Tornin tyyppi: teräs/hybridi	
Mahdollisuudet vaikuttaa tuulivoimalan melupäästöön käytön aikana ja sen vaikutus meluun							
Lapakulman säätö		Pyörimisnopeus		Muu, mikä			
Kyllä	- dB	Kyllä	- dB	Noise mode säätö: Mode 0, no STE		Kyllä	
Ei		Ei		Noise mode, lähtömelutaso		109,2 dB	
AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT							
Third octave sound power levels N163/5.X, F008_276_A17_EN, revision 01, 2019-08-30							
Valmistajan ilmoittama tuulivoimalan tuottama äänitehotaso vastaa keskiäänitasoa ja lisäämällä epävarmuus 1,5 dB(A) saadaan äänitehotaso vastaamaan takuuarvoa.							
Nordexin mukaan:							
The warranted sound power levels are calculated expected mean values. This is common practise in the industry and also other OEMs are following the same approach. Within the Noise Emission Warranty Nordex warrants that a single measurement will be within the confidence interval according to IEC 61400-14.							
Please further be advised, that we limit the Confidence Interval according to the Noise Emission Warranty to a maximum value of 1.5dB(A).							
If you experience challenges in your noise emission calculations, please let us know and we could investigate further.							
Kind regards,							
Chris							
Mallinnuksissa on lisätty hankeomistajan pyynnöstä 2,0 dB(A) voimalaitoksen äänitehotasoihin. Mallinnuksessa käytämme voimalamallia, jossa ei ole melua vaimentavaa sahalaistaa (serrated trailing edge).							
Oktaaveittain [Hz],dB(A)		1/3-oktaaveittain [Hz] LWA dB					
		20	66,5	200	94,8	1600	101,0
63	91,5	25	70,5	250	95,9	2000	99,4
125	97,7	31,5	76,0	315	99,4	2500	97,2
250	101,9	40	79,5	400	99,1	3150	93,8
500	105,2	50	84,6	500	99,6	4000	89,2
1000	106,6	63	85,9	630	102,0	5000	84,1
2000	104,2	80	88,7	800	101,3	6300	83,8
4000	95,4	100	93,4	1000	102,3	8000	81,9
8000	86,6	125	91,9	1250	101,7	10000	77,7
111,2 dB(A)		160	93,2				
Melun erityispiirteiden mittaustulos ja havainnot:							
Kapeakaistaisuus / Tonaalisuus		Impulssimaisuus		Merkityksellinen sykintä (amplitudi-modulaatio)		Muu, Mikä:	
kyllä	ei	kyllä	ei	kyllä	ei	kyllä	ei

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Taulukko 5. Käytetyt mallinnusparametrit ISO 9613-2 laskelmissa sekä melulle altistuvat kohteet.

AKUSTISET TIEDOT/LASKENNAN LÄHTÖTIEDOT			
Laskenta korkeus		Laskentaruudun koko [m·m]	
ISO 9613-2: 4,0 m		25x25 m	
Suhteellinen kosteus		Lämpötila	
70 %	Muu, mikä ja miksi:	ISO 9613-2: 15 C°	
Maastomallin lähde ja tarkkuus			
Maastomallin lähde: MML maastotietokanta		Vaakaresoluutio:1,0	Pystyresoluutio:0,5
Maan- ja vedenpinnan absorption ja heijastuksen huomioiminen, käytetyt kertoimet			
ISO 9613-2	maa-alueet= 0,4; vesialueet= 0		HUOM
Ilmakehän stabiilius laskennassa/meteorologinen korjaus			
Neutraali, (0): Neutraali		Muu, mikä ja miksi:	
Sääolosuhteiden huomiointi; laskennassa käytetty tuulen suunnat ja nopeus			
Tuulen suunta: 0-360°		Tuulen nopeus: 10 metrin korkeudella mitattuna 8 m/s	
Voimalan äänen suuntaavuus ja vaimentuminen			
Vapaa avaruus: kyllä		Muu, mikä, miksi:	

2.1.2 Matalataajuinen melu

Matalataajuinen melu laskettiin Ympäristöministeriön ohjeen 2/2014 mukaisin menetelmin käyttäen voimalavalmistajilta saatuja arvioita niiden äänitehtasoista.

Ohje 2/2014 antaa menetelmän matalataajuisen melun laskentaan rakennusten ulkopuolelle. Sosiaali- ja terveysministeriön Asumisterveysasetus 2015 antaa matalataajuiselle melulle toimenpiderajat asuinhuoneissa. Rakennusten sisälle kantautuva äänitaso arvioitiin Turun AMK:n (Keränen, Hakala ja Hongisto, 2018) julkistamien Anojanssi projektin tulosten mukaisten ääneneristävyysarvoin ja tuloksia verrattiin toimenpiderajoihin.

Taulukko 6. Suomalaisen pientalon julkisivun äänitasoeron alalikiarvo Anojanssi projektin tulosten mukaisesti.

f [Hz]	20	25	31.5	40	50	63	80	100	125	160	200
DL _σ [dB]	7.6	8.3	9.2	10.3	11.5	13.0	14.8	16.8	18.8	21.1	22.8

Matalataajuisen melun laskelmassa huomioitiin maanpinnan muodon vaikutus ohjeen 4/2014 mukaisesti. Tulokset on esitetty taajuuskohtaisena taulukkona hankealuetta ympäröiville asuin- ja lomarakennuksille.

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2.2 Varjostusmallinnus

Taulukko 7. Pilpänkankaan tuulivoimahankkeen mallinnusohjelma ja tuulivoimaloiden koko varjostusmallinuksissa.

MALLINNUSOHJELMAN TIEDOT			
Mallinnusohjelma ja versio: WindPRO version 3.6.355		Mallinnusmenetelmä: ISO 9613-2	
TUULIVOIMALAN (TUULIVOIMALOIDEN TIEDOT)			
Tuulivoimalan valmistaja: Generic		Tyyppi: RD200	Sarjanu- mero/t:-
Nimellisteho: 7,2 MW	Napakorkeus: 200 m	Roottorin halkaisija: 200 m	Tornin tyyppi: teräs/hybridi

Tuulivoimaloiden varjostusvaikutukset on mallinnettu Pilpänkankaan hankkeessa sekä yhteisvaikutushankkeissa (Lapinsalo, Konnunsuo ja Hautakangas) käyttäen roottorinhalkaisijaltaan 200 metristä voimalaitosta 200 metriä korkealla tornilla. Kokonaiskorkeudeltaan voimalat ovat mallinuksissa 300 metriä.

Varjostusvaikutuksia mallinnettiin WindPRO-ohjelman Shadow-moduulilla. Laskennassa varjot huomioidaan, kun aurinko on yli 3 astetta horisontin yläpuolella. Varjoksi lasketaan tilanne, jossa siipi peittää vähintään 20 % auringosta.

Varjostusmallinnuksessa huomioidaan siiven lavan maksimileveys sekä siiven kärjen leveys 90 % etäisyydellä turbiinista. Pilpänkankaan varjostusmallinnuksessa on käytetty siiven lavan maksimileveytenä 5,06 metriä ja siiven kärjen leveytenä 90 % etäisyydellä turbiinista 1,47 metriä.

Varjostusmallin laskennassa on huomioitu hankealueen korkeustiedot, tuulivoimaloiden sijainnit, tuulivoimalan napakorkeudet ja roottorin halkaisija sekä hankealueen aikavyöhyke. Mallinnuksessa otettiin huomioon auringon asema horisontissa eri kellon- ja vuodenaikoina, pilvisyys kuukausittain eli kuinka paljon aurinko paistaa ollessaan horisontin yläpuolella sekä tuulivoimalaitosten arvioitu vuotuinen käyntiaika.

Varjostuksen tarkastelukorkeutena lähialueen asuin- tai lomarakennusten pihapiirissä käytettiin 1,0 metriä ja laskenta-alueen kokoa 5,0 x 5,0 metriä. Laskentaikkunoiden suunnat asennettiin voimaloita kohti ns. "greenhouse mode".

Mallinnus tehtiin niin sanotulle todelliselle tilanteelle (real case). Mallinnus tehtiin yhdelle eri laskentatilanteelle:

- 1) Todellinen tilanne, jossa puuston suojaavaa vaikutusta ei huomioitu (real case, no forest)

Auringon keskimääräiset paistetunnit perustuvat Oulun lentoaseman sääaseman mitattuihin säätietoihin 1991–2010. Laskentojen tuulen suunta ja nopeusjakamana käytettiin NASA:n MERRA-dattaa (Modern Era Retrospective-analysis for Research and Applications) hankealueen läheisyydeltä.

Varjostusmallinnuksen tuloksia on havainnollistettu kartan avulla. Kartalla esitetään varjostusvaikutuksen (1, 8 ja 20 tuntia vuodessa) laajuus. Sen lisäksi mallinnuksessa on erikseen laskettu vaikutus tuulivoimahankealueen ympäristössä oleviin herkkiin kohteisiin.

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2.3 Raja- ja ohjearvot

2.3.1 Melu

Valtioneuvoston asetuksessa (1107/2015) tuulivoimaloille on määritelty suunnitteluarvot päivä- ja yöajan keskiäänitasojen maksimiarvolle. Jos tuulivoimalan melu sisältää tonaalisia, kapeakaistaisia tai impulssimaisia komponentteja, tai se on selvästi amplitudimoduloitunutta, mallinnustuloksiin tulee ohjeen mukaan lisätä viisi desibeliä ennen ohjearvoon vertaamista. Koska ohjearvo sisältää jo tyypillisen tuulivoimamelun piirteet, edellä mainitut äänenpiirteiden tulee olla tuulivoimalalle epätyypillisen voimakkaita, jotta mallinnustuloksissa täytyy huomioida viiden desibelin lisä äänenvoimakkuuteen.

Taulukko 8. Valtioneuvoston asetuksen mukaiset tuulivoimaloiden melutason ohjearvot (Valtioneuvoston asetus 27.8.2015).

Vaikutuskohde	Päivä (7-22)	Yö (22-7)
Pysyvä asutus	45 dB	40 dB
Loma-asutus	45 dB	40 dB
Hoitolaitokset	45 dB	40 dB
Oppilaitokset	45 dB	—
Virkistysalueet	45 dB	—
Leirintäalueet	45 dB	40 dB
Kansallispuistot	40 dB	40 dB

Sosiaali- ja terveysministeriön asetuksessa (545/2015) on annettu matalataajuiselle melulle toimenpiderajoja. Toimenpiderajat koskevat asuinhuoneita ja ne on annettu taajuuspainottamattomina yhden tunnin keskiäänitasoina tersseittäin. Toimenpiderajat koskevat yöaikaa ja päivällä sallitaan 5 dB suuremmat arvot.

Taulukko 9. Matalataajuisen sisämelun tunnin keskiäänitason toimenpiderajat nukkumiseen tarkoitetuissa tiloissa.

Terssikaista Hz	20	25	31,5	40	50	63	80	100	125	160	200
Keskiäänitaso LZeq,1h, dB	74	64	56	49	44	42	40	38	36	34	32
Edellisestä laskettu keskiäänitaso A-painotettuna LAeq,1h, dB	24	19	17	14	14	16	18	19	20	21	21

Lisäksi yöaikainen mahdollisesti unihäiriötä aiheuttava melu, joka erottuu selvästi taustamelusta, ei saa ylittää 25 dB yhden tunnin keskiäänitasona LAeq,1h mitattuna niissä tiloissa, jotka on tarkoitettu nukkumiseen.

2.3.2 Varjostus

Suomessa ei ole viranomaisten antamia yleisiä määräyksiä tuulivoimaloiden muodostaman varjostuksen enimmäiskestoista eikä varjonmuodostuksen arviointiperusteista. Ympäristöministeriön

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tuulivoimarakentamisen suunnitteluohjeistuksessa esitetään käytettäväksi muiden maiden suosituksia välkkeen rajoittamisesta (Ympäristöministeriö 2012).

Useissa maissa on annettu raja-arvoja tai suosituksia hyväksyttävän välkevaikutuksen määrästä. Esimerkiksi Ruotsissa suositus on kahdeksan tuntia vuodessa ja 30 minuuttia päivässä.

Arvioinnissa on tarkasteltu vaikutuksia alueella, jossa varjoja tai välkettä mallinnuksen mukaisessa todellisessa tilanteessa ("real case") esiintyy vähintään kahdeksan tuntia vuodessa.

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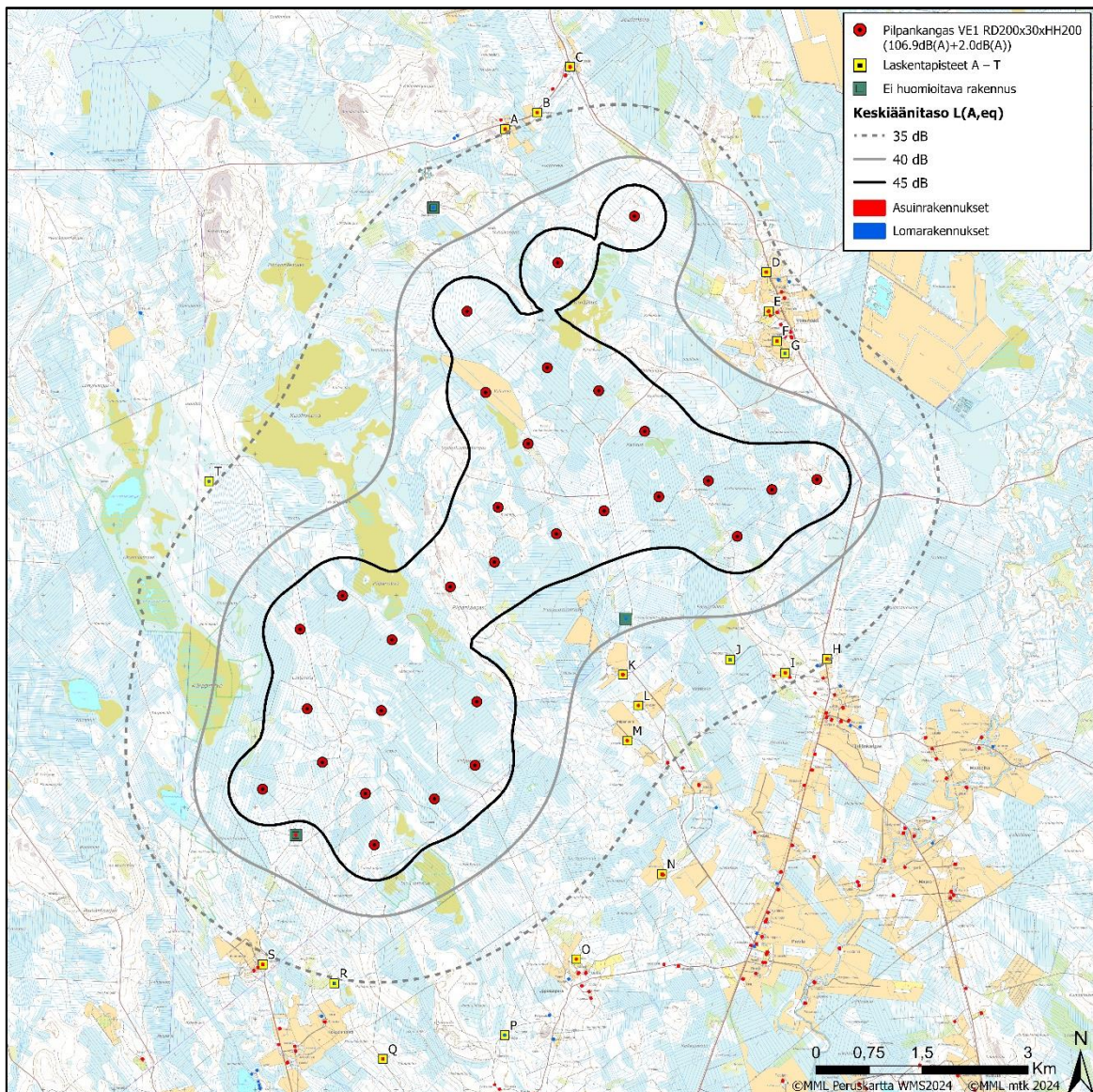
3 MELU- JA VARJOSTUSMALLINNUSTEN TULOKSET

3.1 Melu

3.1.1 Melun laskentatulokset ISO 9613-2 voimalaitoksella Generic RD200–7.2 MW (106,9 dB + 2,0 dB)

Laskennassa ei ole huomioitu häiriintyvinä kohteina hankealueen lähistöllä sijaitsevaa kahta lomarakennusta ja yhtä asuinrakennusta. Pyhännän rakennusvalvonnalle tehdyn tiedustelun mukaan lomarakennusten käyttötarkoitus ei ole lomarakennus, ja hankealueen eteläpuolella sijaitseva asuinrakennus on autiotalo. Nämä kaksi lomarakennusta ja asuinrakennus ovat esitetty kartoilla vihreillä neliöillä.

Vaihtoehtoon 1 (VE1) melumallinnuksen mukaan melutaso 40 dB(A) ei ylitä lähimmillä asuin- tai lomarakennuksilla, (Kuva 1 ja Taulukko 10). Katso tarkemmat laskentatulokset liitteestä 1.



Kuva 1. Melumallinnuksen tulos hankevaihtoehtossa 1 (VE1).

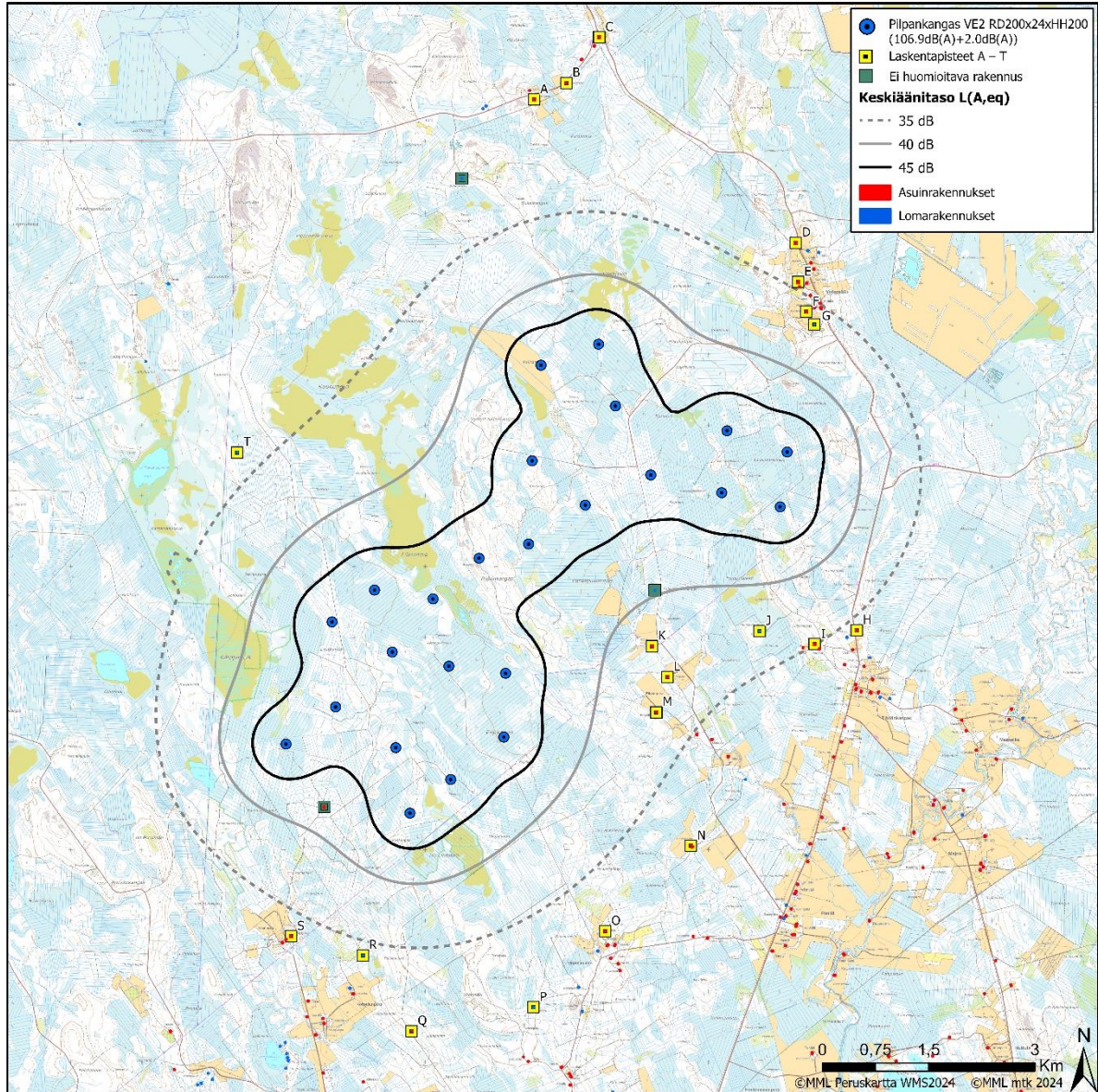
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Taulukko 10. Laskennalliset melutasot Pilpankankaan tuulivoimahankkeen ympäristössä voimalaitoksella Generic RD200–7.2MW hankevaihtoehdossa 1 (VE1).

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta- korkeus (m)	Melutaso dB(A)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	4,0	34,8
Asuinrakennus B (Kivikangas)	467993	7092829	155	4,0	34,6
Asuinrakennus C (Koukkula)	468457	7093473	150	4,0	32,6
Asuinrakennus D (Konola)	471232	7090571	195	4,0	35,9
Asuinrakennus E (Piippo)	471264	7090018	198,6	4,0	36,8
Asuinrakennus F (Pääkkö)	471380	7089598	200	4,0	37,6
Lomarakennus G (Pääkkölä)	471494	7089419	197,5	4,0	37,9
Asuinrakennus H (Peltola)	472092	7085100	169,9	4,0	35,1
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	4,0	35,6
Lomarakennus J (Ahmokangas)	470723	7085089	155	4,0	37,2
Asuinrakennus K (Ketola)	469203	7084876	145	4,0	38,5
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	4,0	37,3
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	4,0	36,9
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	4,0	32,7
Asuinrakennus O (Ketola)	468542	7080851	149,5	4,0	32,6
Lomarakennus P (Kuistila)	467531	7079776	162,3	4,0	31,4
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	4,0	31,3
Lomarakennus R (Korpelanperä)	465124	7080510	140	4,0	34,7
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	4,0	34,4
Lomarakennus T (Kärsämäenneva)	463349	7087611	152,5	4,0	34,7

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Vaihtoehtoon 2 (VE2) melumallinnuksen mukaan melutaso 40 dB(A) ei ylitä lähimmillä asuin- tai lomarakennuksilla, (Kuva 2 ja Taulukko 11). Katso tarkemmat laskentatulokset liitteestä 2.



Kuva 2. Melumallinnuksen tulos hankevaihtoehdossa 2 (VE2).

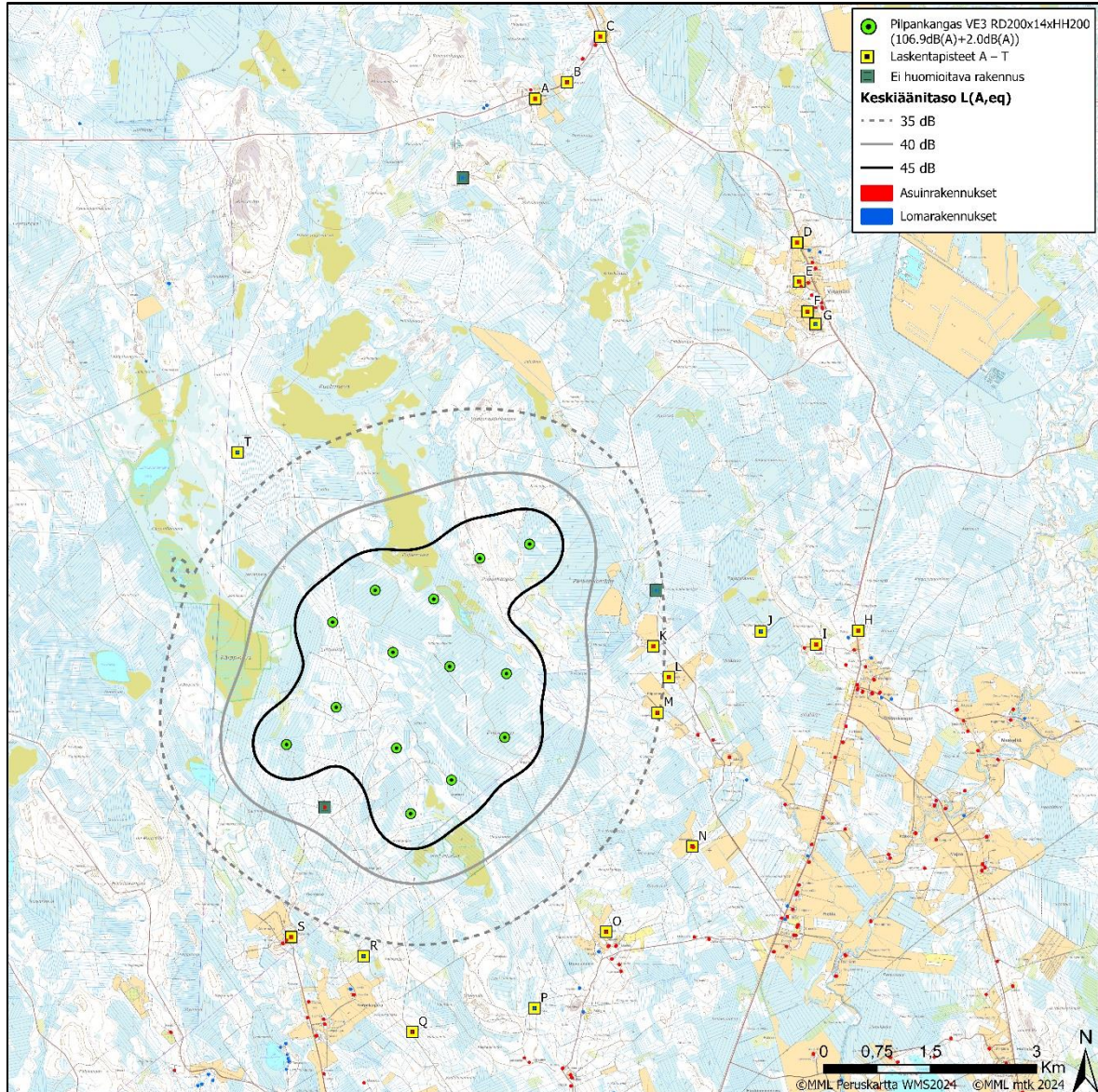
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Taulukko 11. Laskennalliset melutasot Pilpankankaan tuulivoimahankkeen ympäristössä voimalaitoksella Generic RD200–7.2MW hankevaihtoehdossa 2 (VE2).

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta- korkeus (m)	Melutaso dB(A)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	4,0	29,6
Asuinrakennus B (Kivikangas)	467993	7092829	155	4,0	29,2
Asuinrakennus C (Koukkula)	468457	7093473	150	4,0	27,8
Asuinrakennus D (Konola)	471232	7090571	195	4,0	33,0
Asuinrakennus E (Piippo)	471264	7090018	198,6	4,0	34,6
Asuinrakennus F (Pääkkö)	471380	7089598	200	4,0	35,8
Lomarakennus G (Pääkkölä)	471494	7089419	197,5	4,0	36,2
Asuinrakennus H (Peltola)	472092	7085100	169,9	4,0	34,3
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	4,0	35,0
Lomarakennus J (Ahmokangas)	470723	7085089	155	4,0	36,9
Asuinrakennus K (Ketola)	469203	7084876	145	4,0	38,3
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	4,0	37,1
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	4,0	36,7
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	4,0	32,5
Asuinrakennus O (Ketola)	468542	7080851	149,5	4,0	32,4
Lomarakennus P (Kuistila)	467531	7079776	162,3	4,0	31,1
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	4,0	30,9
Lomarakennus R (Korpelanperä)	465124	7080510	140	4,0	34,2
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	4,0	33,7
Lomarakennus T (Kärsämäenneva)	463349	7087611	152,5	4,0	33,8

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Vaihtoehtoon 3 (VE3) melumallinnuksen mukaan melutaso 40 dB(A) ei ylitä lähimmillä asuin- tai lomarakennuksilla, (Kuva 3 ja Taulukko 12). Katso tarkemmat laskentatulokset liitteestä 3.



Kuva 3. Melumallinnuksen tulos hankevaihtoehdossa 3 (VE3).

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Taulukko 12. Laskennalliset melutasot Pilpankankaan tuulivoimahankkeen ympäristössä voimalaitoksella Generic RD200–7.2MW hankevaihtoehdossa 3 (VE3).

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta- korkeus (m)	Melutaso dB(A)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	4,0	23,6
Asuinrakennus B (Kivikangas)	467993	7092829	155	4,0	23,2
Asuinrakennus C (Koukkula)	468457	7093473	150	4,0	22,1
Asuinrakennus D (Konola)	471232	7090571	195	4,0	24,0
Asuinrakennus E (Piippo)	471264	7090018	198,6	4,0	24,7
Asuinrakennus F (Pääkkö)	471380	7089598	200	4,0	25,0
Lomarakennus G (Pääkkölä)	471494	7089419	197,5	4,0	25,1
Asuinrakennus H (Peltola)	472092	7085100	169,9	4,0	27,1
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	4,0	28,4
Lomarakennus J (Ahmokangas)	470723	7085089	155	4,0	30,5
Asuinrakennus K (Ketola)	469203	7084876	145	4,0	35,6
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	4,0	34,7
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	4,0	35,1
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	4,0	31,3
Asuinrakennus O (Ketola)	468542	7080851	149,5	4,0	31,8
Lomarakennus P (Kuistila)	467531	7079776	162,3	4,0	30,5
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	4,0	30,5
Lomarakennus R (Korpelanperä)	465124	7080510	140	4,0	33,9
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	4,0	33,5
Lomarakennus T (Kärsämäenneva)	463349	7087611	152,5	4,0	32,9

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3.1.2 Matalataajuiset melutasot voimalaitoksella Generic RD200–7.2 MW (106,9 dB + 2,0 dB)

Tuulivoimaloiden tuottamien matalien äänien eli matalataajuisen (=pienitaajuisen) melun laskennallisia tuloksia verrattu Sosiaali- ja terveysministeriön (STM) Asumisterveysasetuksessa (545/2015) annettuihin toimenpiderajoihin. Nämä ovat enimmäisarvoja, jotka on laadittu yöaikaiselle melulle nukkumiseen tarkoitettuihin tiloihin. Toimenpiderajaa on verrattu myös äänitasoon tarkasteltujen rakennusten ulkopuolella.

Sisätilojen laskennalliset tulokset on saatu huomioimalla tutkitut suomalaisen pientalon ulkovaipan ääneneristysten alalikiarvot (84 % persentiili, Anojanssi 2019). Arvioinnin epävarmuustekijäksi voidaan kuitenkin sanoa se, että yleisellä tasolla rakennusten ääneneristävyydessä on suuria yksilöllisiä eroja pienillä taajuuksilla ja sisällä vallitsevaan äänitasoon vaikuttaa merkittävästi myös huoneen mitat sekä sisustus.

Laskennassa ei ole huomioitu edellisen kappaleen melukartoissa esitettyä kahta lomarakennusta ja yhtä asuinrakennusta. Pyhännän rakennusvalvonnalle tehdyn tiedustelun mukaan näiden kahden lomarakennusten käyttötarkoitus ei ole lomarakennus, ja hankealueen eteläpuolella sijaitseva asuinrakennus on autiotalo.

Mallinnettaessa Pilpänkankaan tuulivoimahankkeen matalataajuisia melutasoja voimalaitostyyppillä Generic RD200 7.2 MW vaihtoehdossa 1 (VE1), vaihtoehdossa 2 (VE2) ja vaihtoehdossa 3 (VE3) matalataajuinen melu ei ylitä Sosiaali- ja terveysministeriön asumisterveysohjearvoa laskentapisteissä A–T.

Taulukoissa 13–15 on esitetty matalataajuisen melun laskentatulokset hankevaihtoehdoissa 1 (VE1), 2 (VE2) ja 3 (VE3). Taulukoissa näkyy toimenpiderajan alitus (negatiivinen arvo) tai ylitys (positiivinen arvo). Rakennusten sisätiloissa melu on enimmillään 4,3 dB alle toimenpiderajan taajuudella 50 Hz (Asuinrakennus K vaihtoehdossa 1 (VE1)). Katso tarkemmat laskentatulokset liitteistä 4–6.

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Taulukko 13. Matalataajuisen melun laskentatulokset hankevaihtoehdossa 1 (VE1).

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L _{eq,1h} – Asu- misterveysase- tus sisällä	Hz	L _{eq,1h} – Asu- misterveysase- tus sisällä	Hz
Asuinrakennus A (Nurmiaho)	6,3	100	-7,6	50
Asuinrakennus B (Kivikangas)	6,0	100	-7,8	50
Asuinrakennus C (Koukkula)	4,6	100	-9,1	50
Asuinrakennus D (Konola)	7,3	100	-6,6	50
Asuinrakennus E (Piippo)	8,1	100	-5,9	50
Asuinrakennus F (Pääkkö)	8,6	100	-5,4	50
Lomarakennus G (Pääkkölä)	8,8	100	-5,2	50
Asuinrakennus H (Peltola)	6,8	100	-7,1	50
Asuinrakennus I (Nuuttila)	7,2	100	-6,7	50
Lomarakennus J (Ahmokangas)	8,5	100	-5,4	50
Asuinrakennus K (Ketola)	9,7	100	-4,3	50
Asuinrakennus L (Tuohipuro)	8,8	100	-5,2	50
Asuinrakennus M (Pilpanperä)	8,4	100	-5,5	50
Asuinrakennus N (Hanhikaarto)	5,3	100	-8,4	50
Asuinrakennus O (Ketola)	5,0	100	-8,7	50
Lomarakennus P (Kuistila)	4,0	100	-9,7	50
Asuinrakennus Q (Hautalehto)	3,8	100	-9,8	50
Lomarakennus R (Korpelanperä)	6,3	100	-7,6	50
Asuinrakennus S (Myllymäki)	6,0	100	-7,8	50
Lomarakennus T (Kärsämäenneva)	6,7	100	-7,2	50

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Taulukko 14. Matalataajuisen melun laskentatulokset hankevaihtoehdossa 2 (VE2).

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L eq,1h – Asu- misterveysase- tus sisällä	Hz	L eq,1h – Asu- misterveysase- tus sisällä	Hz
Asuinrakennus A (Nurmiaho)	2,5	100	-11,1	50
Asuinrakennus B (Kivikangas)	2,2	100	-11,4	50
Asuinrakennus C (Koukkula)	1,1	80	-12,3	50
Asuinrakennus D (Konola)	5,0	100	-8,8	50
Asuinrakennus E (Piippo)	6,1	100	-7,8	50
Asuinrakennus F (Pääkkö)	6,9	100	-7,0	50
Lomarakennus G (Pääkkölä)	7,2	100	-6,8	50
Asuinrakennus H (Peltola)	6,0	100	-7,9	50
Asuinrakennus I (Nuuttila)	6,6	100	-7,3	50
Lomarakennus J (Ahmokangas)	8,0	100	-6,0	50
Asuinrakennus K (Ketola)	9,4	100	-4,7	50
Asuinrakennus L (Tuohipuro)	8,5	100	-5,6	50
Asuinrakennus M (Pilpanperä)	8,2	100	-5,8	50
Asuinrakennus N (Hanhikaarto)	4,9	100	-8,8	50
Asuinrakennus O (Ketola)	4,7	100	-9,0	50
Lomarakennus P (Kuistila)	3,6	100	-10,0	50
Asuinrakennus Q (Hautalehto)	3,4	100	-10,2	50
Lomarakennus R (Korpelanperä)	5,8	100	-8,1	50
Asuinrakennus S (Myllymäki)	5,5	100	-8,4	50
Lomarakennus T (Kärsämäenneva)	5,9	100	-8,0	50

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Taulukko 15. Matalataajuisen melun laskentatulokset hankevaihtoehdossa 3 (VE3).

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L _{eq,1h} – Asu- misterveysase- tus sisällä	Hz	L _{eq,1h} – Asu- misterveysase- tus sisällä	Hz
Asuinrakennus A (Nurmiaho)	-2,5	80	-15,8	50
Asuinrakennus B (Kivikangas)	-2,9	80	-16,2	50
Asuinrakennus C (Koukkula)	-3,8	80	-17,0	50
Asuinrakennus D (Konola)	-2,2	80	-15,6	50
Asuinrakennus E (Piippo)	-1,7	80	-15,1	50
Asuinrakennus F (Pääkkö)	-1,4	80	-14,8	50
Lomarakennus G (Pääkkölä)	-1,4	80	-14,8	50
Asuinrakennus H (Peltola)	0,3	100	-13,2	50
Asuinrakennus I (Nuuttila)	1,4	100	-12,3	50
Lomarakennus J (Ahmokangas)	2,9	100	-10,9	50
Asuinrakennus K (Ketola)	6,7	100	-7,3	50
Asuinrakennus L (Tuohipuro)	6,1	100	-7,9	50
Asuinrakennus M (Pilpanperä)	6,4	100	-7,7	50
Asuinrakennus N (Hanhikaarto)	3,5	100	-10,3	50
Asuinrakennus O (Ketola)	3,8	100	-10,0	50
Lomarakennus P (Kuistila)	2,8	100	-10,9	50
Asuinrakennus Q (Hautalehto)	2,8	100	-11,0	50
Lomarakennus R (Korpelanperä)	5,4	100	-8,6	50
Asuinrakennus S (Myllymäki)	5,1	100	-8,9	50
Lomarakennus T (Kärsämäenneva)	4,7	100	-9,3	50

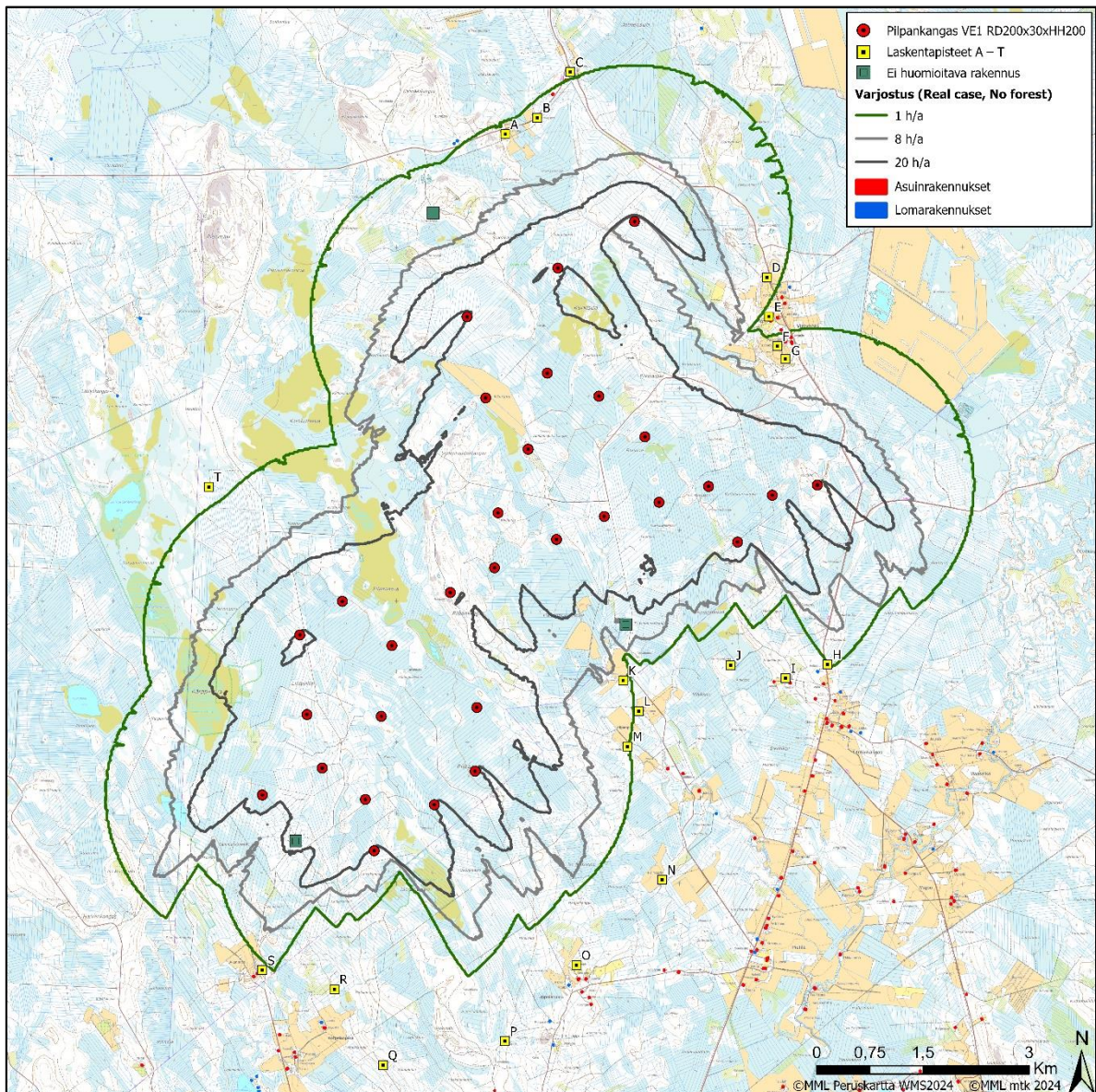
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3.2 Varjostus

3.2.1 Varjostusmallinnus voimalaitoksella Generic RD200 HH200, "Real Case, No forest"

Varjostusmallinnuksissa ei ole huomioitu häiriintyvänä kohteina kahta hankealueen lähistöllä sijaitsevaa lomarakennusta ja yhtä asuinrakennusta. Nämä rakennukset on merkitty karttoihin vihreillä neliöillä. Katso tarkemmat tiedot kappaleesta 3.1.1.

Hankevaihtoehdossa 1 (VE1) varjostusvaikutusalueelle 8 h/a ei sijoitu yhtään asuin- tai lomarakennusta. (Kuva 4, Taulukko 16). Katso tarkemmat laskentatulokset liitteestä 7.



Kuva 4. Varjostusmallinnuksen tulos, kun puuston suojaavaa vaikutusta ei ole huomioitu hankevaihtoehdossa 1 (VE1).

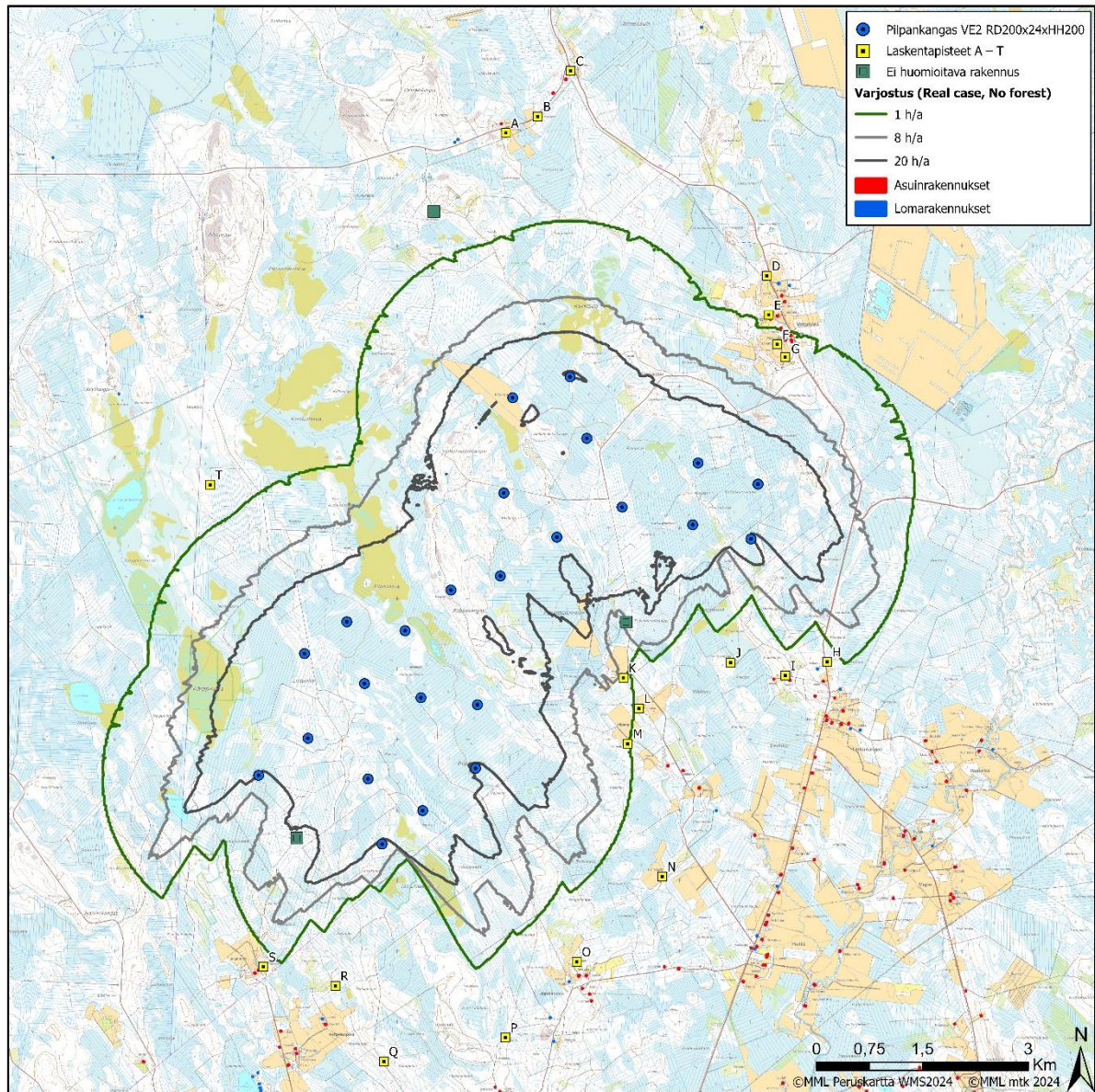
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Taulukko 16. Varjostusmallinnuksen tulos VE1, kun puuston suojaavaa vaikutusta ei ole huomioitu "real case, no forest".

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	5,0 x 5,0	2:43
Asuinrakennus B (Kivikangas)	467993	7092829	155	5,0 x 5,0	3:03
Asuinrakennus C (Koukkula)	468457	7093473	150	5,0 x 5,0	0:00
Asuinrakennus D (Konola)	471232	7090571	195	5,0 x 5,0	2:40
Asuinrakennus E (Piippo)	471264	7090018	198,6	5,0 x 5,0	0:00
Asuinrakennus F (Pääkkö)	471380	7089598	200	5,0 x 5,0	3:31
Lomarakenus G (Pääkkölä)	471494	7089419	197,5	5,0 x 5,0	4:22
Asuinrakennus H (Peltola)	472092	7085100	169,9	5,0 x 5,0	0:45
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	5,0 x 5,0	0:00
Lomarakenus J (Ahmokangas)	470723	7085089	155	5,0 x 5,0	0:00
Asuinrakennus K (Ketola)	469203	7084876	145	5,0 x 5,0	1:41
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	5,0 x 5,0	0:00
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	5,0 x 5,0	3:50
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	5,0 x 5,0	0:00
Asuinrakennus O (Ketola)	468542	7080851	149,5	5,0 x 5,0	0:00
Lomarakenus P (Kuistila)	467531	7079776	162,3	5,0 x 5,0	0:00
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	5,0 x 5,0	0:00
Lomarakenus R (Korpelanperä)	465124	7080510	140	5,0 x 5,0	0:00
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	5,0 x 5,0	0:00
Lomarakenus T (Kärsämäenneva)	463349	7087611	152,5	5,0 x 5,0	0:00

Hankevaihtoehdossa 2 (VE2) varjostusvaikutusalueelle 8 h/a ei sijoitu yhtään asuin- tai lomarakennusta, (Kuva 5, Taulukko 17). Katso tarkemmat laskentatulokset liitteestä 8.

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Kuva 5. Varjostusmallinnuksen tulos, kun puuston suojaavaa vaikutusta ei ole huomioitu hankevaihtoehdossa 2 (VE2).

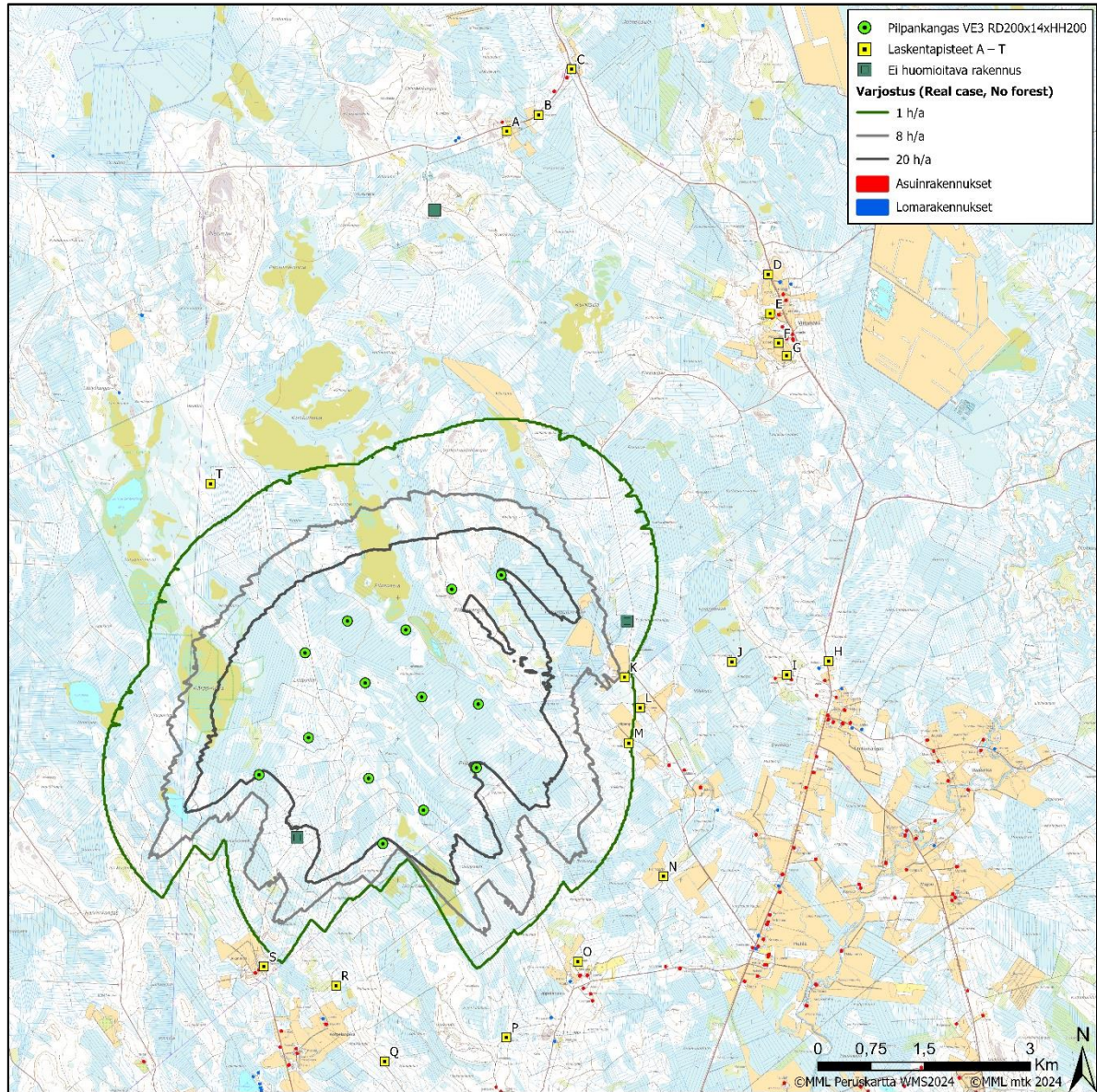
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Taulukko 17. Varjostusmallinnuksen tulos VE2, kun puuston suojaavaa vaikutusta ei ole huomioitu "real case, no forest".

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	5,0 x 5,0	0:00
Asuinrakennus B (Kivikangas)	467993	7092829	155	5,0 x 5,0	0:00
Asuinrakennus C (Koukkula)	468457	7093473	150	5,0 x 5,0	0:00
Asuinrakennus D (Konola)	471232	7090571	195	5,0 x 5,0	0:00
Asuinrakennus E (Piippo)	471264	7090018	198,6	5,0 x 5,0	0:00
Asuinrakennus F (Pääkkö)	471380	7089598	200	5,0 x 5,0	2:36
Lomarakenus G (Pääkkölä)	471494	7089419	197,5	5,0 x 5,0	3:04
Asuinrakennus H (Peltola)	472092	7085100	169,9	5,0 x 5,0	0:00
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	5,0 x 5,0	0:00
Lomarakenus J (Ahmokangas)	470723	7085089	155	5,0 x 5,0	0:00
Asuinrakennus K (Ketola)	469203	7084876	145	5,0 x 5,0	1:41
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	5,0 x 5,0	0:00
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	5,0 x 5,0	3:50
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	5,0 x 5,0	0:00
Asuinrakennus O (Ketola)	468542	7080851	149,5	5,0 x 5,0	0:00
Lomarakenus P (Kuistila)	467531	7079776	162,3	5,0 x 5,0	0:00
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	5,0 x 5,0	0:00
Lomarakenus R (Korpelanperä)	465124	7080510	140	5,0 x 5,0	0:00
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	5,0 x 5,0	0:00
Lomarakenus T (Kärsämäenneva)	463349	7087611	152,5	5,0 x 5,0	0:00

Hankevaihtoehdossa 3 (VE3) varjostusvaikutusalueelle 8 h/a ei sijoitu yhtään asuin- tai lomarakennusta, (Kuva 6, Taulukko 18). Katso tarkemmat laskentatulokset liitteestä 9.

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Kuva 6. Varjostusmallinnuksen tulos, kun puuston suojaavaa vaikutusta ei ole huomioitu hankevaihtoehdossa 3 (VE3).

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Taulukko 18. Varjostusmallinnuksen tulos VE3, kun puuston suojaavaa vaikutusta ei ole huomioitu "real case, no forest".

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	5,0 x 5,0	0:00
Asuinrakennus B (Kivikangas)	467993	7092829	155	5,0 x 5,0	0:00
Asuinrakennus C (Koukkula)	468457	7093473	150	5,0 x 5,0	0:00
Asuinrakennus D (Konola)	471232	7090571	195	5,0 x 5,0	0:00
Asuinrakennus E (Piippo)	471264	7090018	198,6	5,0 x 5,0	0:00
Asuinrakennus F (Pääkkö)	471380	7089598	200	5,0 x 5,0	0:00
Lomarakennus G (Pääkkölä)	471494	7089419	197,5	5,0 x 5,0	0:00
Asuinrakennus H (Peltola)	472092	7085100	169,9	5,0 x 5,0	0:00
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	5,0 x 5,0	0:00
Lomarakennus J (Ahmokangas)	470723	7085089	155	5,0 x 5,0	0:00
Asuinrakennus K (Ketola)	469203	7084876	145	5,0 x 5,0	1:41
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	5,0 x 5,0	0:00
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	5,0 x 5,0	3:50
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	5,0 x 5,0	0:00
Asuinrakennus O (Ketola)	468542	7080851	149,5	5,0 x 5,0	0:00
Lomarakennus P (Kuistila)	467531	7079776	162,3	5,0 x 5,0	0:00
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	5,0 x 5,0	0:00
Lomarakennus R (Korpelanperä)	465124	7080510	140	5,0 x 5,0	0:00
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	5,0 x 5,0	0:00
Lomarakennus T (Kärsämäenneva)	463349	7087611	152,5	5,0 x 5,0	0:00

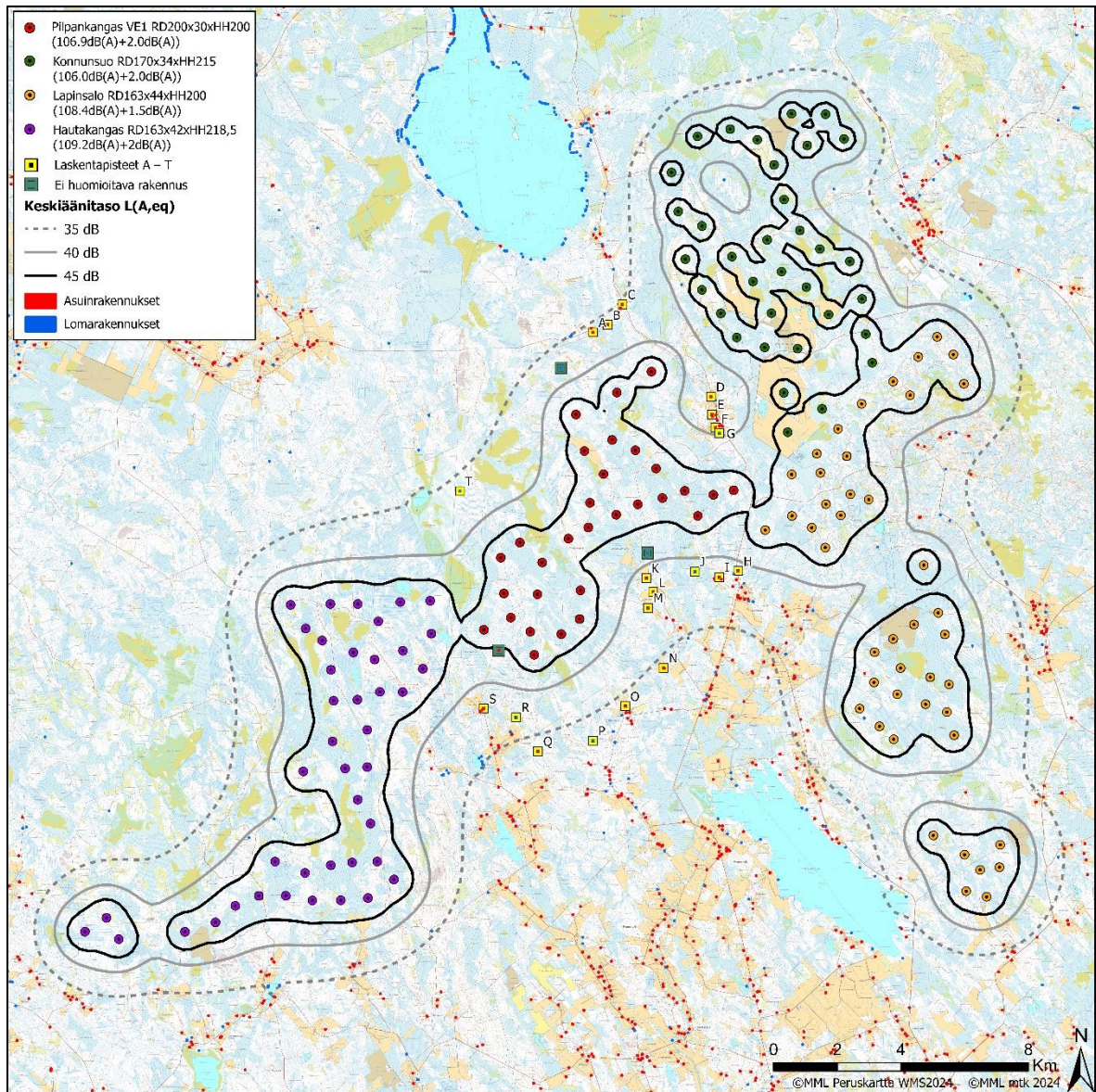
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4 MELUN JA VARJOSTUKSEN YHTEISMALLINNUSTEN TULOKSET

4.1 Melu

4.1.1 Yhteismelun laskentatulokset ISO 9613-2

Hankevaihtoehtoon 1 (VE1) yhteismelun mallinnuksen mukaan melutaso 40 dB(A) ei ylitä Pilpankan-
kaan tuulivoimahankkeen lähistöllä mittauspisteissä A – T, (Kuva 7, Taulukko 19). Katso tarkemmat
laskentatulokset liitteestä 10.



Kuva 7. Yhteismelumallinnuksen tulos hankevaihtoehtossa 1 (VE1).

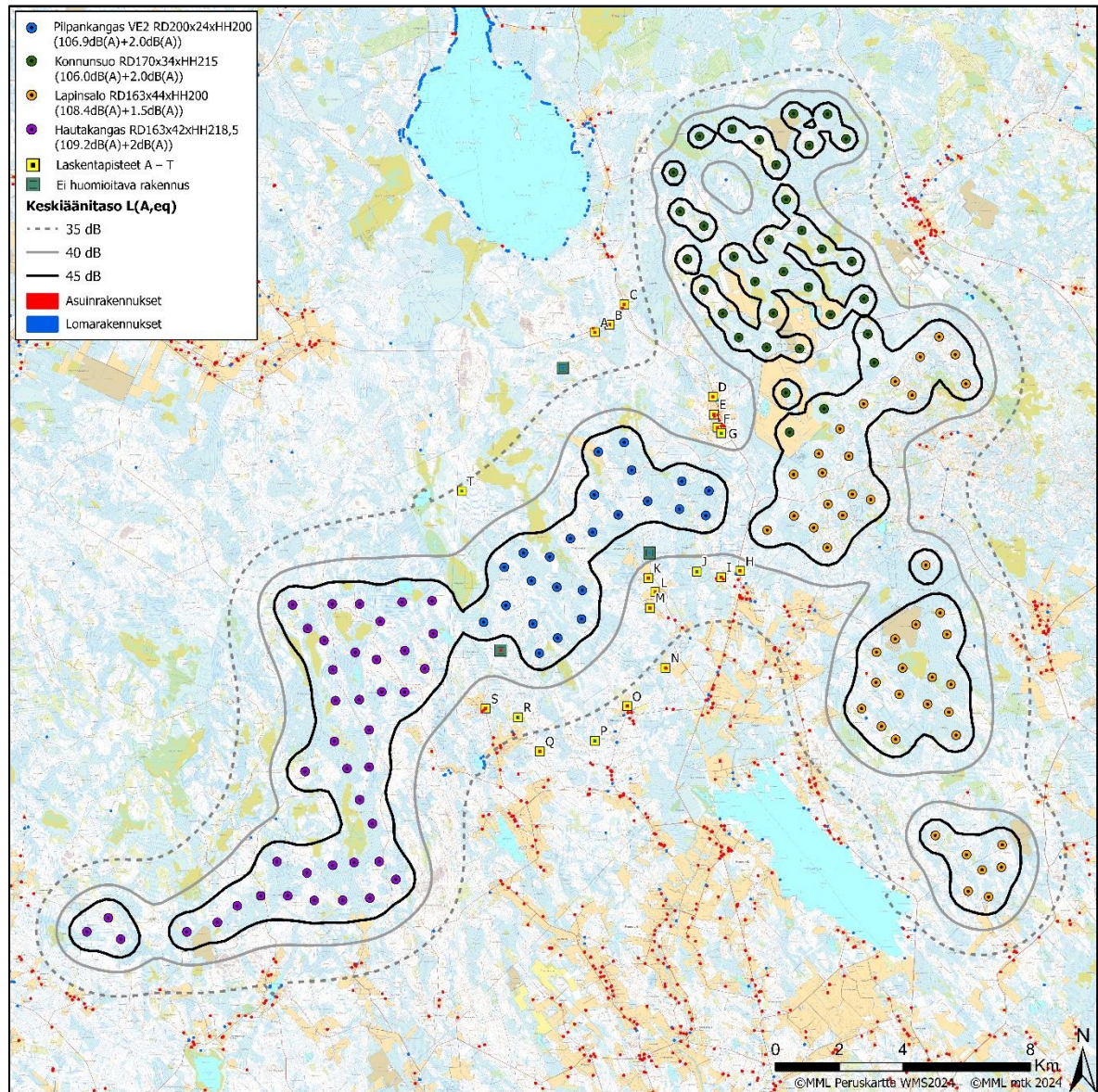
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Taulukko 19. Laskennalliset yhteismelutasot Pilpankankaan tuulivoimahankkeen ympäristössä hankevaihtoehdossa 1 (VE1).

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta- korkeus (m)	Melutaso dB(A)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	4,0	35,9
Asuinrakennus B (Kivikangas)	467993	7092829	155	4,0	35,9
Asuinrakennus C (Koukkula)	468457	7093473	150	4,0	35,2
Asuinrakennus D (Konola)	471232	7090571	195	4,0	38,5
Asuinrakennus E (Piippo)	471264	7090018	198,6	4,0	38,9
Asuinrakennus F (Pääkkö)	471380	7089598	200	4,0	39,5
Lomarakennus G (Pääkkölä)	471494	7089419	197,5	4,0	39,9
Asuinrakennus H (Peltola)	472092	7085100	169,9	4,0	38,9
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	4,0	38,0
Lomarakennus J (Ahmokangas)	470723	7085089	155	4,0	38,6
Asuinrakennus K (Ketola)	469203	7084876	145	4,0	39,1
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	4,0	38,1
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	4,0	37,7
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	4,0	34,4
Asuinrakennus O (Ketola)	468542	7080851	149,5	4,0	34,2
Lomarakennus P (Kuistila)	467531	7079776	162,3	4,0	33,3
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	4,0	33,9
Lomarakennus R (Korpelanperä)	465124	7080510	140	4,0	36,7
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	4,0	38,0
Lomarakennus T (Kärsämäenneva)	463349	7087611	152,5	4,0	36,0

Hankevaihtoehdon 2 (VE2) yhteismelun mallinnuksen mukaan melutaso 40 dB(A) ei ylity Pilpankankaan tuulivoimahankkeen lähistöllä mittauspisteissä A – T, (Kuva 8, Taulukko 20). Katso tarkemmat laskentatulokset liitteestä 11.

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Kuva 8. Yhteismelumallinnuksen tulos hankevaihtoehdossa 2 (VE2).

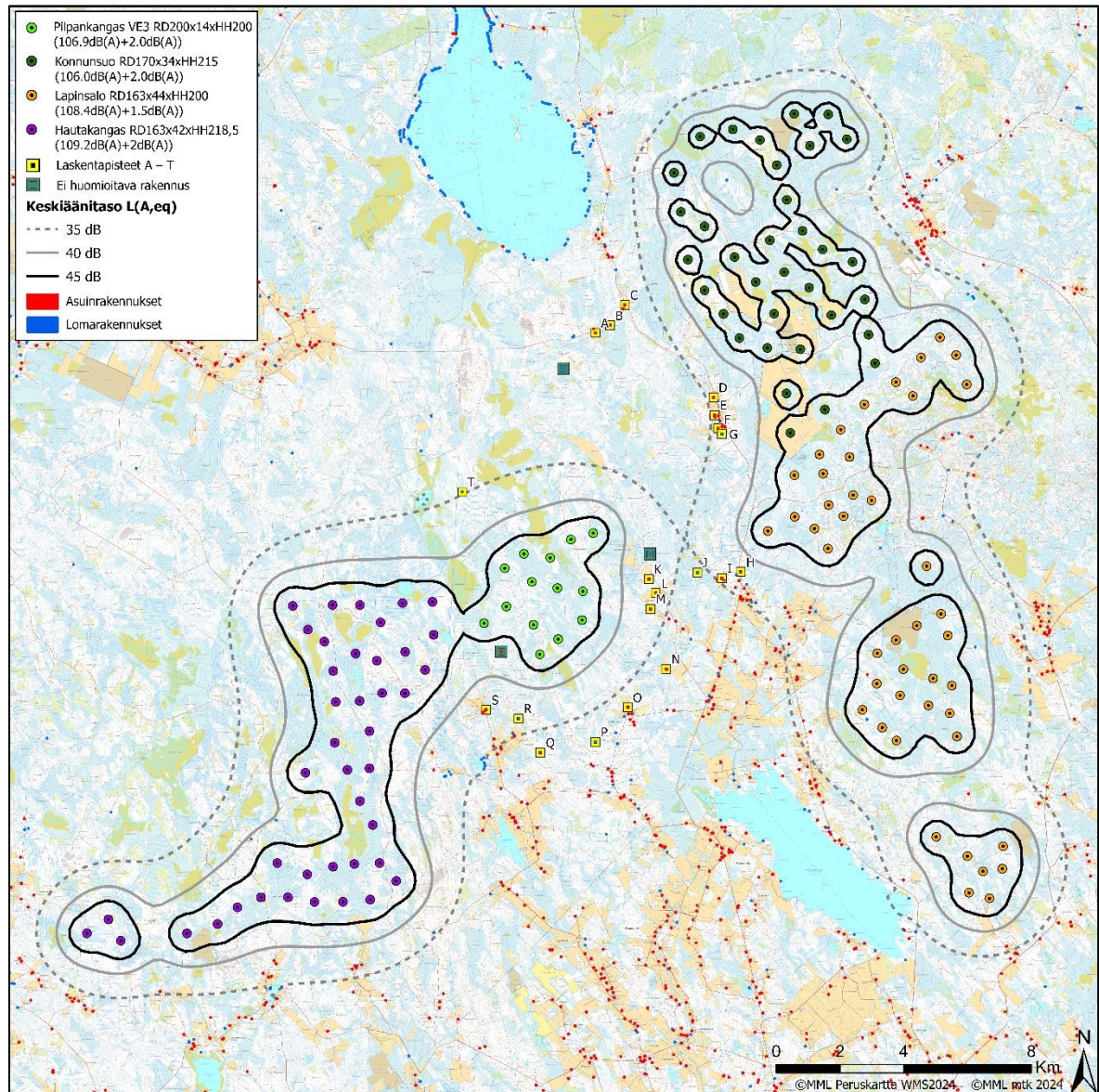
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Taulukko 20. Laskennalliset yhteismelutasot Pilpankankaan tuulivoimahankkeen ympäristössä hankevaihtoehdossa 2 (VE2).

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta- korkeus (m)	Melutaso dB(A)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	4,0	32,5
Asuinrakennus B (Kivikangas)	467993	7092829	155	4,0	32,7
Asuinrakennus C (Koukkula)	468457	7093473	150	4,0	33,2
Asuinrakennus D (Konola)	471232	7090571	195	4,0	37,3
Asuinrakennus E (Piippo)	471264	7090018	198,6	4,0	37,8
Asuinrakennus F (Pääkkö)	471380	7089598	200	4,0	38,5
Lomarakennus G (Pääkkölä)	471494	7089419	197,5	4,0	38,9
Asuinrakennus H (Peltola)	472092	7085100	169,9	4,0	38,6
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	4,0	37,7
Lomarakennus J (Ahmokangas)	470723	7085089	155	4,0	38,3
Asuinrakennus K (Ketola)	469203	7084876	145	4,0	38,9
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	4,0	37,9
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	4,0	37,5
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	4,0	34,2
Asuinrakennus O (Ketola)	468542	7080851	149,5	4,0	34,0
Lomarakennus P (Kuistila)	467531	7079776	162,3	4,0	33,1
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	4,0	33,7
Lomarakennus R (Korpelanperä)	465124	7080510	140	4,0	36,4
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	4,0	37,7
Lomarakennus T (Kärsämäenneva)	463349	7087611	152,5	4,0	35,4

Hankevaihtoehdon 3 (VE3) yhteismelun mallinnuksen mukaan melutaso 40 dB(A) ei ylity Pilpankankaan tuulivoimahankkeen lähistöllä mittauspisteissä A – T, (Kuva 9, Taulukko 21). Katso tarkemmat laskentatulokset liitteestä 12.

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Kuva 9. Yhteismelumallinnuksen tulos hankevaihtoehdossa 3 (VE3).

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Taulukko 21. Laskennalliset yhteismelutasot Pilpänkankaan tuulivoimahankkeen ympäristössä hankevaihtoehdossa 3 (VE3).

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Laskenta- korkeus (m)	Melutaso dB(A)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	4,0	30,4
Asuinrakennus B (Kivikangas)	467993	7092829	155	4,0	31,0
Asuinrakennus C (Koukkula)	468457	7093473	150	4,0	32,2
Asuinrakennus D (Konola)	471232	7090571	195	4,0	35,5
Asuinrakennus E (Piippo)	471264	7090018	198,6	4,0	35,3
Asuinrakennus F (Pääkkö)	471380	7089598	200	4,0	35,5
Lomarakenus G (Pääkkölä)	471494	7089419	197,5	4,0	35,8
Asuinrakennus H (Peltola)	472092	7085100	169,9	4,0	37,0
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	4,0	35,3
Lomarakenus J (Ahmokangas)	470723	7085089	155	4,0	34,7
Asuinrakennus K (Ketola)	469203	7084876	145	4,0	36,7
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	4,0	36,0
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	4,0	36,3
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	4,0	33,5
Asuinrakennus O (Ketola)	468542	7080851	149,5	4,0	33,5
Lomarakenus P (Kuistila)	467531	7079776	162,3	4,0	32,8
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	4,0	33,5
Lomarakenus R (Korpelanperä)	465124	7080510	140	4,0	36,2
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	4,0	37,6
Lomarakenus T (Kärsämäenneva)	463349	7087611	152,5	4,0	34,8

4.1.2 Matalataajuiset melutasot (yhteisvaikutus)

Pilpänkankaan ja sen lähistöllä olevien tuulivoimahankkeiden (Lapinsalo, Konnunsuo ja Hautakangas) aiheuttama matalataajuinen yhteismelu ei Pilpänkankaan missään hankevaihtoehdossa ylitä Sosiaali- ja terveysministeriön asumisterveysohjearvoa laskentapisteidensä sisätiloissa.

Taulukoissa 22–24 on esitetty matalataajuisen melun laskentatulokset hankevaihtoehdoissa VE1, VE2 ja VE3. Taulukoissa esitetään toimenpiderajan alitus (negatiivinen arvo) tai ylitys (positiivinen arvo). Rakennusten sisätiloissa melu on enimmillään 1,8 dB alle toimenpiderajan taajuudella 50 Hz (Lomarakenus G).

Tarkemmat matalataajuisen yhteismelun laskentatulokset ja kuvaajat on esitetty liitteissä 13–15.

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Taulukko 22. Matalataajuisen yhteismelun laskentatulokset VE1.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L eq,1h – Asu- misterveysase- tus sisällä	Hz	L eq,1h – Asu- misterveysase- tus sisällä	Hz
Asuinrakennus A (Nurmiaho)	8,1	100	-5,0	50
Asuinrakennus B (Kivikangas)	8,1	100	-5,0	50
Asuinrakennus C (Koukkula)	7,7	100	-5,3	50
Asuinrakennus D (Konola)	10,4	100	-2,6	50
Asuinrakennus E (Piippo)	10,7	80	-2,3	50
Asuinrakennus F (Pääkkö)	11,2	80	-2,0	50
Lomarakennus G (Pääkkölä)	11,4	80	-1,8	50
Asuinrakennus H (Peltola)	11,0	80	-2,2	50
Asuinrakennus I (Nuuttila)	10,4	80	-2,7	50
Lomarakennus J (Ahmokangas)	10,6	80	-2,6	50
Asuinrakennus K (Ketola)	10,8	100	-2,5	50
Asuinrakennus L (Tuohipuro)	10,1	80	-3,0	50
Asuinrakennus M (Pilpanperä)	9,8	80	-3,3	50
Asuinrakennus N (Hanhikaarto)	7,9	80	-4,9	50
Asuinrakennus O (Ketola)	7,4	80	-5,2	50
Lomarakennus P (Kuistila)	6,8	100	-5,6	50
Asuinrakennus Q (Hautalehto)	7,5	100	-5,0	50
Lomarakennus R (Korpelanperä)	9,3	100	-3,6	50
Asuinrakennus S (Myllymäki)	10,3	100	-2,7	50
Lomarakennus T (Kärsämäenneva)	8,8	100	-4,2	50

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Taulukko 23. Matalataajuisen yhteismelun laskentatulokset VE2.

Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L _{eq,1h} – Asu- misterveysase- tus sisällä	Hz	L _{eq,1h} – Asu- misterveysase- tus sisällä	Hz
Asuinrakennus A (Nurmiaho)	6,0	100	-6,5	50
Asuinrakennus B (Kivikangas)	6,2	100	-6,3	50
Asuinrakennus C (Koukkula)	6,4	100	-6,2	50
Asuinrakennus D (Konola)	9,5	80	-3,3	50
Asuinrakennus E (Piippo)	9,9	80	-3,0	50
Asuinrakennus F (Pääkkö)	10,4	80	-2,6	50
Lomarakennus G (Pääkkölä)	10,6	80	-2,4	50
Asuinrakennus H (Peltola)	10,8	80	-2,3	50
Asuinrakennus I (Nuuttila)	10,1	80	-2,9	50
Lomarakennus J (Ahmokangas)	10,3	80	-2,8	50
Asuinrakennus K (Ketola)	10,6	100	-2,7	50
Asuinrakennus L (Tuohipuro)	9,9	80	-3,2	50
Asuinrakennus M (Pilpanperä)	9,6	80	-3,4	50
Asuinrakennus N (Hanhikaarto)	7,7	80	-5,0	50
Asuinrakennus O (Ketola)	7,2	80	-5,3	50
Lomarakennus P (Kuistila)	6,7	100	-5,7	50
Asuinrakennus Q (Hautalehto)	7,4	100	-5,1	50
Lomarakennus R (Korpelanperä)	9,1	100	-3,8	50
Asuinrakennus S (Myllymäki)	10,1	100	-2,8	50
Lomarakennus T (Kärsämäenneva)	8,3	100	-4,6	50

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Taulukko 24. Matalataajuisen yhteismelun laskentatulokset VE3.

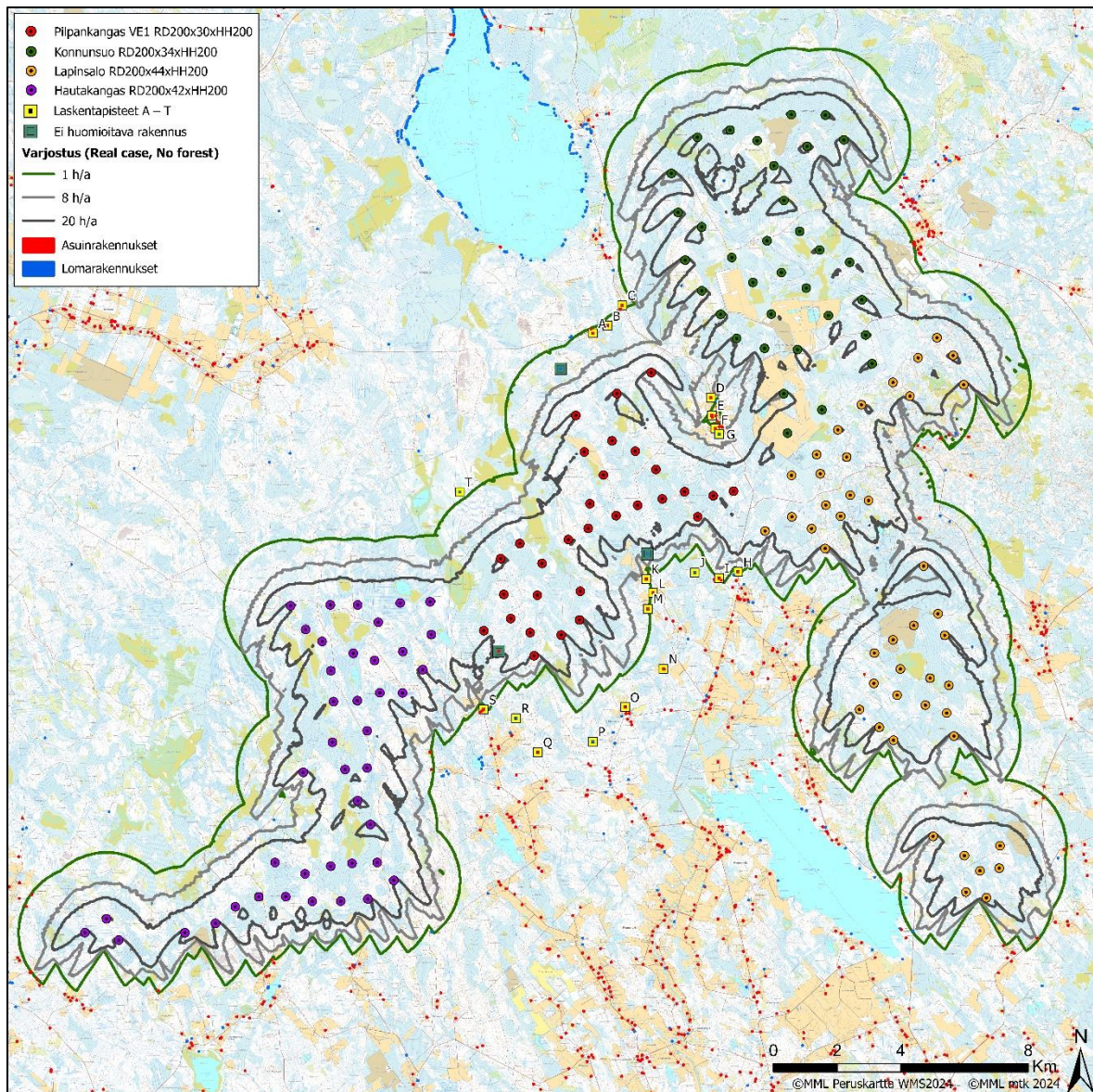
Rakennus	Äänitaso ulkona		Äänitaso sisällä	
	L eq,1h – Asu- misterveysase- tus sisällä	Hz	L eq,1h – Asu- misterveysase- tus sisällä	Hz
Asuinrakennus A (Nurmiaho)	5,6	80	-6,8	50
Asuinrakennus B (Kivikangas)	6,1	80	-6,3	50
Asuinrakennus C (Koukkula)	6,9	80	-5,7	50
Asuinrakennus D (Konola)	9,2	80	-3,4	50
Asuinrakennus E (Piippo)	8,9	80	-3,6	50
Asuinrakennus F (Pääkkö)	8,9	80	-3,6	50
Lomarakennus G (Pääkkölä)	9,1	80	-3,4	50
Asuinrakennus H (Peltola)	9,6	80	-3,2	50
Asuinrakennus I (Nuuttila)	8,6	80	-4,1	50
Lomarakennus J (Ahmokangas)	8,2	80	-4,5	50
Asuinrakennus K (Ketola)	8,8	80	-4,1	50
Asuinrakennus L (Tuohipuro)	8,4	80	-4,4	50
Asuinrakennus M (Pilpanperä)	8,5	80	-4,4	50
Asuinrakennus N (Hanhikaarto)	6,9	80	-5,6	50
Asuinrakennus O (Ketola)	6,6	100	-5,9	50
Lomarakennus P (Kuistila)	6,2	100	-6,2	50
Asuinrakennus Q (Hautalehto)	6,9	100	-5,7	50
Lomarakennus R (Korpelanperä)	8,7	100	-4,2	50
Asuinrakennus S (Myllymäki)	9,8	100	-3,2	50
Lomarakennus T (Kärsämäenneva)	7,6	100	-5,2	50

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4.2 Varjostus

4.2.1 Varjostuksen yhteisvaikutus, "Real Case, No forest"

Hankevaihtoehtoon 1 (VE1) yhteisvaikutusmallinnuksessa varjostusvaikutusalueelle 8 h/a ei sijoitu yhtään asuin- tai lomarakennusta, (Kuva 10, Taulukko 25). Tarkemmat laskentatulokset on esitetty liitteessä 16.



Kuva 10. Varjostuksen yhteismallinnuksen tulos hankevaihtoehtossa 1 (VE1), kun puuston suojaavaa vaikutusta ei ole huomioitu.

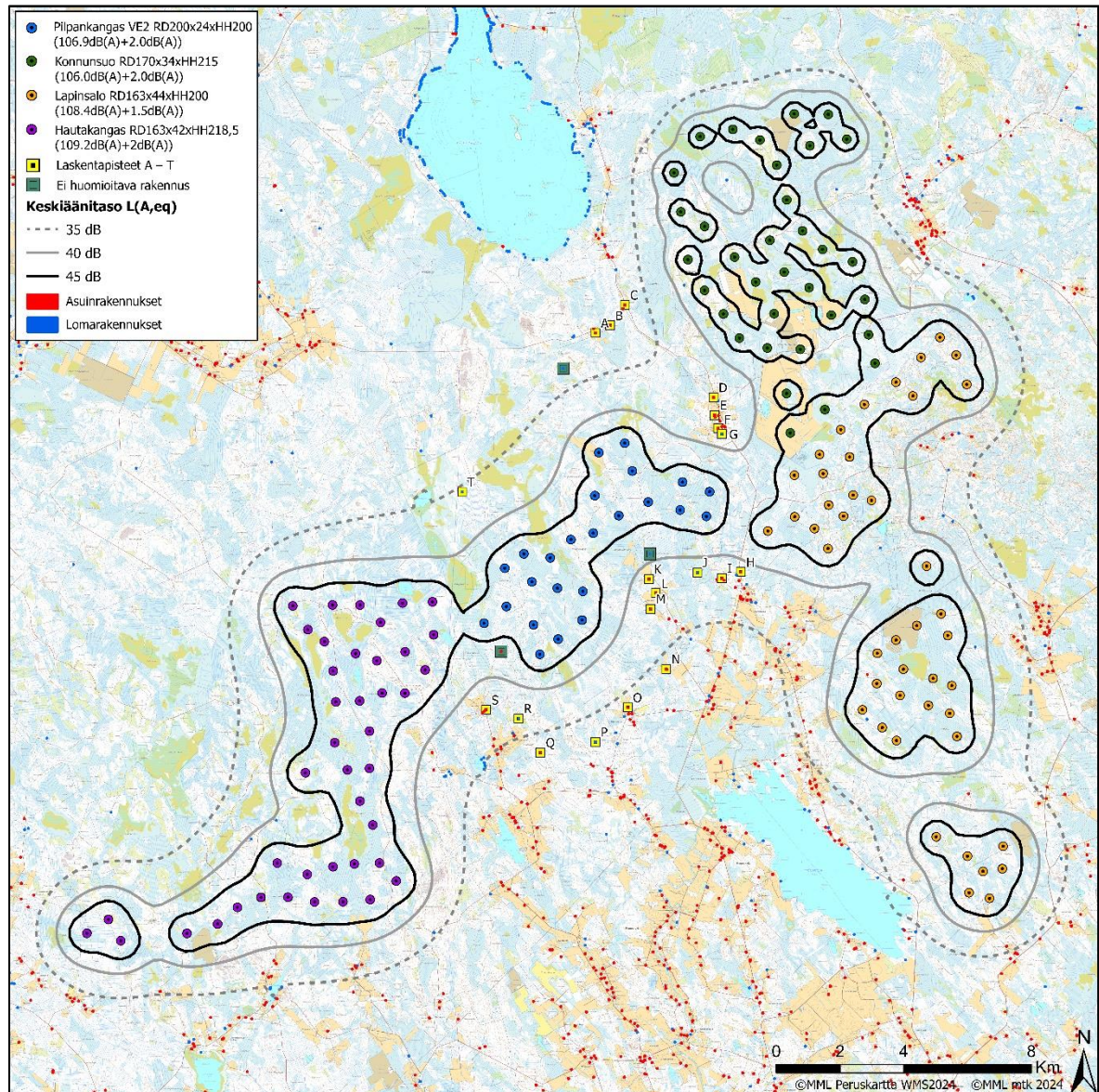
27.11.2024

Taulukko 25. Varjostuksen yhteismallinnuksen tulos hankevaihtoehdossa 1 (VE1), kun puuston suojaavaa vaikutusta ei ole huomioitu "Real Case, No forest".

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	5,0 x 5,0	2:43
Asuinrakennus B (Kivikangas)	467993	7092829	155	5,0 x 5,0	3:03
Asuinrakennus C (Koukkula)	468457	7093473	150	5,0 x 5,0	0:00
Asuinrakennus D (Konola)	471232	7090571	195	5,0 x 5,0	2:40
Asuinrakennus E (Piippo)	471264	7090018	198,6	5,0 x 5,0	0:00
Asuinrakennus F (Pääkkö)	471380	7089598	200	5,0 x 5,0	3:31
Lomarakennus G (Pääkkölä)	471494	7089419	197,5	5,0 x 5,0	4:22
Asuinrakennus H (Peltola)	472092	7085100	169,9	5,0 x 5,0	0:45
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	5,0 x 5,0	5:08
Lomarakennus J (Ahmokangas)	470723	7085089	155	5,0 x 5,0	0:00
Asuinrakennus K (Ketola)	469203	7084876	145	5,0 x 5,0	1:41
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	5,0 x 5,0	0:00
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	5,0 x 5,0	3:50
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	5,0 x 5,0	0:00
Asuinrakennus O (Ketola)	468542	7080851	149,5	5,0 x 5,0	0:00
Lomarakennus P (Kuistila)	467531	7079776	162,3	5,0 x 5,0	0:00
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	5,0 x 5,0	0:00
Lomarakennus R (Korpelanperä)	465124	7080510	140	5,0 x 5,0	0:00
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	5,0 x 5,0	0:00
Lomarakennus T (Kärsämäenneva)	463349	7087611	152,5	5,0 x 5,0	0:00

Hankevaihtoehdon 2 (VE2) yhteisvaikutusmallinnuksessa varjostusvaikutusalueelle 8 h/a ei sijoitu yhtään asuin- tai lomarakennusta, (Kuva 11, Taulukko 26). Tarkemmat laskentatulokset on esitetty liitteessä 17.

27.11.2024



Kuva 11. Varjostuksen yhteismallinnuksen tulos hankevaihtoehdossa 2 (VE2), kun puuston suojaavaa vaikutusta ei ole huomioitu.

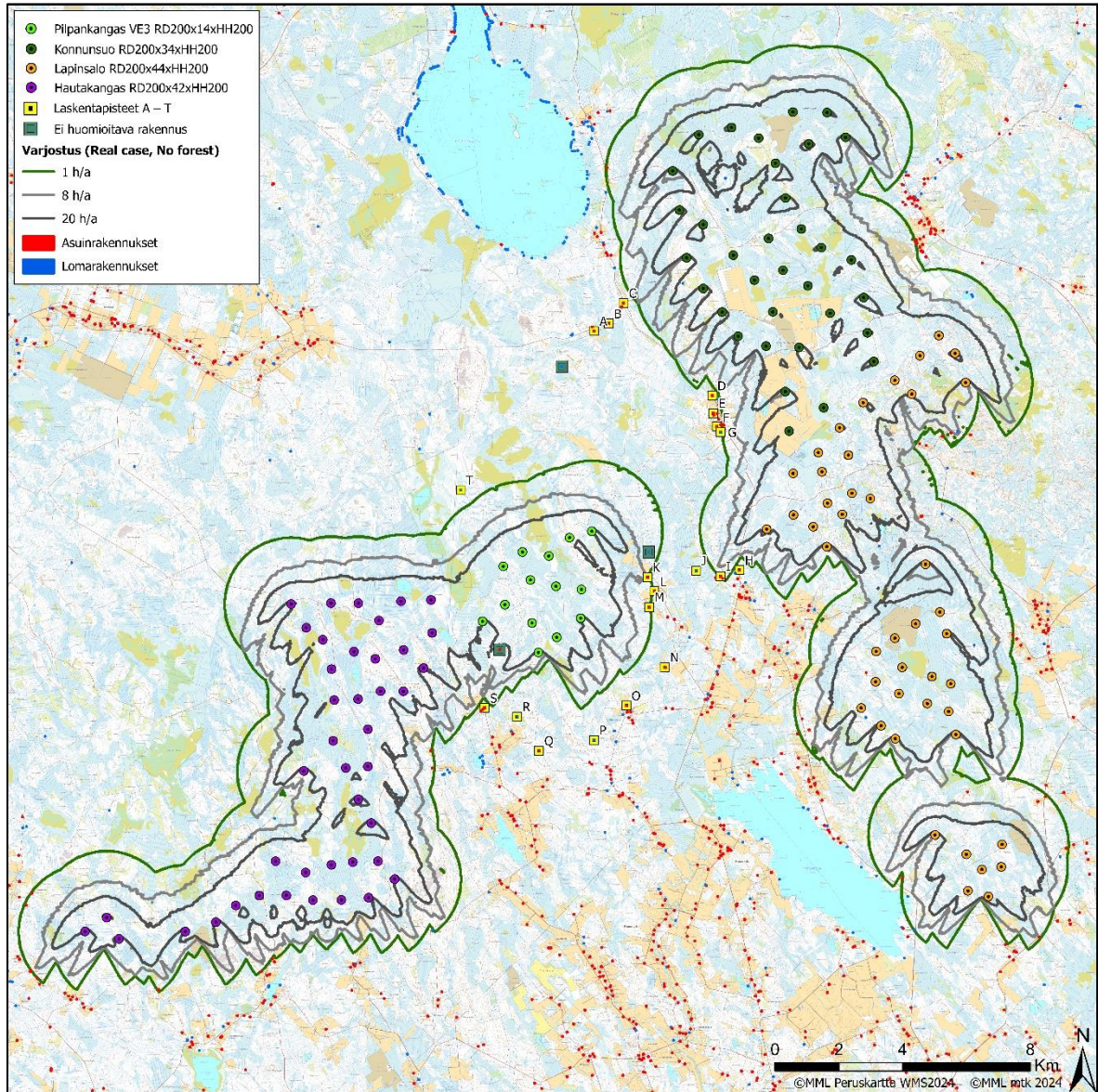
27.11.2024

Taulukko 26. Varjostuksen yhteismallinnuksen tulos hankevaihtoehdossa 2 (VE2), kun puuston suojaavaa vaikutusta ei ole huomioitu "Real Case, No forest".

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	5,0 x 5,0	0:00
Asuinrakennus B (Kivikangas)	467993	7092829	155	5,0 x 5,0	0:00
Asuinrakennus C (Koukkula)	468457	7093473	150	5,0 x 5,0	0:00
Asuinrakennus D (Konola)	471232	7090571	195	5,0 x 5,0	0:00
Asuinrakennus E (Piippo)	471264	7090018	198,6	5,0 x 5,0	0:00
Asuinrakennus F (Pääkkö)	471380	7089598	200	5,0 x 5,0	2:36
Lomarakennus G (Pääkkölä)	471494	7089419	197,5	5,0 x 5,0	3:04
Asuinrakennus H (Peltola)	472092	7085100	169,9	5,0 x 5,0	0:00
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	5,0 x 5,0	5:08
Lomarakennus J (Ahmokangas)	470723	7085089	155	5,0 x 5,0	0:00
Asuinrakennus K (Ketola)	469203	7084876	145	5,0 x 5,0	1:41
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	5,0 x 5,0	0:00
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	5,0 x 5,0	3:50
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	5,0 x 5,0	0:00
Asuinrakennus O (Ketola)	468542	7080851	149,5	5,0 x 5,0	0:00
Lomarakennus P (Kuistila)	467531	7079776	162,3	5,0 x 5,0	0:00
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	5,0 x 5,0	0:00
Lomarakennus R (Korpelanperä)	465124	7080510	140	5,0 x 5,0	0:00
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	5,0 x 5,0	0:00
Lomarakennus T (Kärsämäenneva)	463349	7087611	152,5	5,0 x 5,0	0:00

Hankevaihtoehdon 3 (VE3) yhteisvaikutusmallinnuksessa varjostusvaikutusalueelle 8 h/a ei sijoitu yhtään asuin- tai lomarakennusta, (Kuva 12, Taulukko 27). Tarkemmat laskentatulokset on esitetty liitteessä 18.

27.11.2024



Kuva 12. Varjostuksen yhteismallinnuksen tulos hankevaihtoehdossa 3 (VE3), kun puuston suojaavaa vaikutusta ei ole huomioitu.

27.11.2024

Taulukko 27. Varjostuksen yhteismallinnuksen tulos hankevaihtoehdossa 3 (VE3), kun puuston suojaavaa vaikutusta ei ole huomioitu "Real Case, No forest".

	ETRS89-TM35 Itä	ETRS89-TM35 Pohjoinen	Z (m)	Lasken- taikkuna (m)	Varjostus (h/a)
Asuinrakennus A (Nurmiaho)	467539	7092595	157,5	5,0 x 5,0	0:00
Asuinrakennus B (Kivikangas)	467993	7092829	155	5,0 x 5,0	0:00
Asuinrakennus C (Koukkula)	468457	7093473	150	5,0 x 5,0	0:00
Asuinrakennus D (Konola)	471232	7090571	195	5,0 x 5,0	0:00
Asuinrakennus E (Piippo)	471264	7090018	198,6	5,0 x 5,0	0:00
Asuinrakennus F (Pääkkö)	471380	7089598	200	5,0 x 5,0	0:00
Lomarakennus G (Pääkkölä)	471494	7089419	197,5	5,0 x 5,0	0:00
Asuinrakennus H (Peltola)	472092	7085100	169,9	5,0 x 5,0	0:00
Asuinrakennus I (Nuuttila)	471499	7084904	165,2	5,0 x 5,0	5:08
Lomarakennus J (Ahmokangas)	470723	7085089	155	5,0 x 5,0	0:00
Asuinrakennus K (Ketola)	469203	7084876	145	5,0 x 5,0	1:41
Asuinrakennus L (Tuohipuro)	469423	7084440	143,5	5,0 x 5,0	0:00
Asuinrakennus M (Pilpanperä)	469264	7083942	142,5	5,0 x 5,0	3:50
Asuinrakennus N (Hanhikaarto)	469753	7082056	142,5	5,0 x 5,0	0:00
Asuinrakennus O (Ketola)	468542	7080851	149,5	5,0 x 5,0	0:00
Lomarakennus P (Kuistila)	467531	7079776	162,3	5,0 x 5,0	0:00
Asuinrakennus Q (Hautalehto)	465810	7079440	141,8	5,0 x 5,0	0:00
Lomarakennus R (Korpelanperä)	465124	7080510	140	5,0 x 5,0	0:00
Asuinrakennus S (Myllymäki)	464106	7080779	139,3	5,0 x 5,0	0:00
Lomarakennus T (Kärsämäenneva)	463349	7087611	152,5	5,0 x 5,0	0:00

FCG Finnish Consulting Group Oy

Aarni Nikkola, ins. AMK
Laatija

Henna-Riikka Rintamäki, ins. AMK
Tarkastaja

6.5.2024

LIITTEET

Liite 1. Pilpankankaan tuulivoimahanke - Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2 /2014 (VE1) Generic RD200–7.2 MW.

Project:

Pyhätä_Pilpangkangas

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

12.4.2024 10.41/3.6.377

DECIBEL - Main Result

Calculation: Pilpangkangas VE1_30xRD200xHH200_20240410_108.9dB

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhätä_f

Area type with hard ground: Järvet_lammet_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

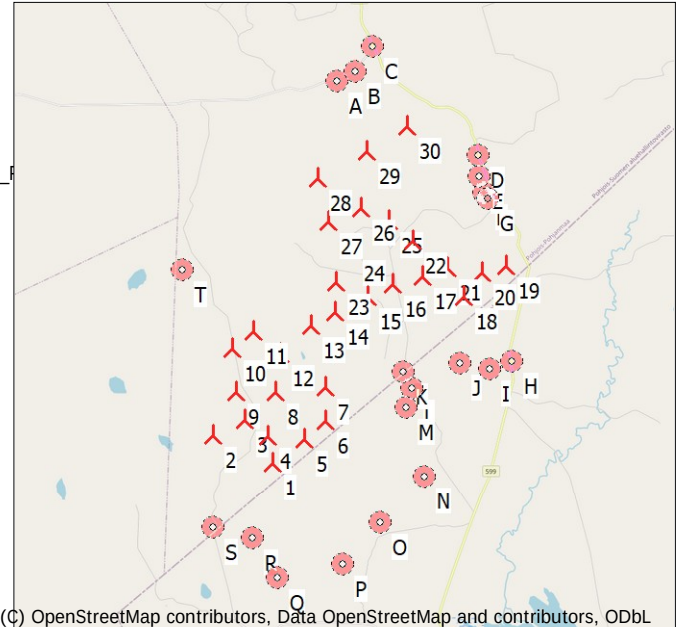
Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more

restrictive, positive is less restrictive.:

0,0 dB(A)



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

East	North	Z	Row data/Description	WTG type		Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	Lwa,ref [dB(A)]
				Valid	Manufact.				Creator	Name		
1 465 686	7 082 467	165,4	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
2 464 106	7 083 255	147,6	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
3 464 951	7 083 636	154,2	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
4 465 561	7 083 192	163,3	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
5 466 536	7 083 117	165,1	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
6 467 111	7 083 592	159,6	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
7 467 136	7 084 492	159,4	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
8 465 786	7 084 367	164,6	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
9 464 736	7 084 392	152,2	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
10 464 636	7 085 517	155,2	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
11 465 236	7 085 992	159,1	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
12 465 936	7 085 367	160,8	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
13 466 761	7 086 117	170,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
14 467 386	7 086 467	159,7	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
15 468 261	7 086 867	156,9	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
16 468 936	7 087 192	156,2	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
17 469 711	7 087 392	157,4	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
18 470 821	7 086 831	160,6	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
19 471 948	7 087 636	182,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
20 471 311	7 087 492	168,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
21 470 411	7 087 617	162,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
22 469 511	7 088 317	169,3	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
23 467 436	7 087 242	169,3	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
24 467 861	7 088 142	165,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
25 468 861	7 088 892	163,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
26 468 133	7 089 218	165,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
27 467 261	7 088 867	167,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
28 466 998	7 090 015	168,4	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
29 468 282	7 090 703	164,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
30 469 365	7 091 361	164,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9

Calculation Results

Sound level

Noise sensitive area

No.	Name	East	North	Z	Immission height	Demands		Sound level	Distance to noise demand
						Noise [dB(A)]	From WTGs [dB(A)]		
A	Asuinrakennus A (Nurmiaho)	467 539	7 092 595	157,5	4,0	40,0	34,8	1 029	
B	Asuinrakennus B (Kivikangas)	467 993	7 092 829	155,0	4,0	40,0	34,6	1 055	
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	4,0	40,0	32,6	1 428	
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	4,0	40,0	35,9	1 113	

To be continued on next page...

DECIBEL - Main Result

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB

...continued from previous page

Noise sensitive area

No.	Name	East	North	Z [m]	Immission height [m]	Demands		Sound level	
						Noise [dB(A)]	From WTGs [dB(A)]	Distance to noise demand [m]	
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	4,0	40,0	36,8		933
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	4,0	40,0	37,6		621
G	Lomarakenus G (Pääkkölä)	471 494	7 089 419	197,5	4,0	40,0	37,9		496
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	4,0	40,0	35,1		1 031
I	Asuinrakennus I (Nuutila)	471 499	7 084 904	165,2	4,0	40,0	35,6		954
J	Lomarakenus J (Ahmokangas)	470 723	7 085 089	155,0	4,0	40,0	37,2		615
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	4,0	40,0	38,5		511
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	4,0	40,0	37,3		946
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	4,0	40,0	36,9		873
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	4,0	40,0	32,7		1 928
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	4,0	40,0	32,6		1 800
P	Lomarakenus P (Kuistila)	467 531	7 079 776	162,3	4,0	40,0	31,4		2 158
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	4,0	40,0	31,3		2 018
R	Lomarakenus R (Korpelanperä)	465 124	7 080 510	140,0	4,0	40,0	34,7		1 020
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	4,0	40,0	34,4		1 196
T	Lomarakenus T (Kärsämäenneva)	463 349	7 087 611	152,5	4,0	40,0	34,7		1 256

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	10295	10615	11349	9819	9387	9125	9058	6926	6303	5678	4262	4225	3870	4087	3282	3263	3030	2037	2313	5650
2	9951	10332	11106	10213	9847	9651	9621	8197	7575	6866	5349	5448	5204	5773	5046	4882	4178	2928	2476	4422
3	9325	9683	10443	9356	8976	8768	8732	7289	6670	5951	4429	4543	4324	5055	4544	4643	4283	3131	2980	4286
4	9608	9938	10681	9305	8894	8654	8600	6804	6180	5499	4012	4058	3778	4343	3791	3944	3761	2718	2819	4942
5	9530	9820	10532	8809	8364	8091	8017	5899	5275	4627	3194	3175	2850	3387	3027	3487	3749	2966	3373	5510
6	9012	9278	9972	8104	7650	7368	7290	5204	4580	3909	2454	2462	2181	3056	3093	3840	4352	3668	4117	5505
7	8112	8380	9077	7329	6897	6639	6577	4993	4382	3636	2102	2287	2198	3575	3904	4733	5224	4462	4793	4906
8	8412	8744	9489	8254	7870	7658	7622	6348	5738	4989	3454	3637	3504	4591	4468	4912	4928	3914	3963	4058
9	8668	9043	9813	8964	8617	8440	8422	7390	6782	6027	4493	4687	4550	5534	5199	5397	5068	3902	3668	3505
10	7649	8045	8825	8309	8011	7882	7889	7468	6890	6102	4612	4906	4889	6177	6086	6430	6190	5031	4768	2458
11	6992	7371	8144	7544	7248	7124	7134	6914	6357	5560	4121	4465	4520	5991	6113	6627	6578	5484	5335	2487
12	7403	7739	8488	7424	7072	6894	6877	6162	5582	4795	3304	3608	3621	5053	5214	5815	5929	4925	4940	3425
13	6524	6823	7549	6310	5957	5783	5770	5427	4891	4093	2739	3146	3317	5044	5560	6388	6745	5842	5963	3725
14	6129	6390	7087	5623	5257	5075	5058	4901	4400	3610	2415	2874	3148	5006	5734	6693	7202	6373	6567	4197
15	5773	5967	6609	4747	4352	4145	4118	4219	3786	3037	2203	2691	3093	5038	6023	7129	7822	7090	7372	4969
16	5580	5715	6299	4084	3661	3429	3391	3787	3436	2760	2332	2795	3267	5201	6354	7549	8359	7694	8029	5603
17	5638	5701	6209	3523	3050	2766	2699	3305	3064	2516	2567	2966	3480	5337	6645	7923	8858	8271	8670	6366
18	6633	6631	7050	3762	3217	2823	2674	2148	2043	1745	2538	2770	3282	4893	6400	7785	8930	8510	9040	7513
19	6635	6527	6801	3020	2478	2042	1839	2540	2768	2827	3892	4073	4566	5997	7592	9016	10240	9867	10417	8599
20	6346	6284	6627	3079	2526	2106	1935	2517	2595	2475	3360	3589	4099	5656	7196	8593	9753	9330	9848	7964
21	5747	5745	6173	3065	2547	2205	2101	3027	2923	2548	2996	3328	3851	5601	7020	8354	9384	8859	9302	7063
22	4710	4760	5262	2835	2442	2266	2268	4125	3950	3449	3455	3878	4383	6266	7529	8768	9619	8956	9276	6203
23	5353	5614	6314	5048	4728	4594	4604	5125	4688	3929	2953	3435	3773	5680	6487	7467	7970	7119	7271	4104
24	4464	4688	5364	4154	3885	3808	3850	5211	4870	4185	3531	4018	4429	6374	7323	8373	8941	8109	8266	4544
25	3932	4031	4599	2904	2653	2616	2684	4982	4782	4235	4031	4488	4967	6895	8048	9213	9933	9178	9405	5660
26	3429	3614	4268	3382	3232	3270	3367	5713	5471	4874	4472	4949	5396	7343	8377	9461	10050	9213	9350	5046
27	3738	4028	4758	4320	4165	4183	4268	6126	5802	5124	4439	4927	5318	7253	8118	9096	9539	8627	8682	4109
28	2636	2984	3753	4270	4266	4402	4535	7078	6810	6175	5592	6079	6482	8422	9293	10253	10642	9688	9678	4370
29	2032	2145	2775	2953	3060	3290	3459	6776	6631	6122	5900	6366	6833	8772	9856	10953	11532	10671	10767	5822
30	2204	2009	2299	2027	2326	2678	2881	6829	6800	6418	6487	6921	7420	9313	10542	11730	12440	11651	11817	7089

Project:

Pyhäntä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Aarni Nikkola / aarni.nikkola@fcg.fi
Calculated:
12.4.2024 10.41/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhäntä_Pilpankangas_8.w2r (9)

Area type with hard ground: Järvet_lammet_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: Generic RD200 HH200 7200 200.0 !O!

Noise: V172 - 7,2 MW PO7200 STE + 2dB

Source Source/Date Creator Edited

Vestas 30.6.2022 USER 25.3.2024 10.00

DMS no.: 0128-4336_00

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
					[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	200,0	8,0	108,9	No	92,4	100,0	103,3	103,5	101,9	97,4	89,9	79,2

Noise sensitive area: A Asuinrakennus A (Nurmiaho)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: B Asuinrakennus B (Kivikangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: C Asuinrakennus C (Koukkula)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB

Noise sensitive area: D Asuinrakennus D (Konola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: E Asuinrakennus E (Piippo)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: F Asuinrakennus F (Pääkkö)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: G Lomarakennus G (Pääkkölä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: H Asuinrakennus H (Peltola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: I Asuinrakennus I (Nuuttila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: J Lomarakennus J (Ahmokangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: K Asuinrakennus K (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: L Asuinrakennus L (Tuohipuro)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: M Asuinrakennus M (Pilpanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: N Asuinrakennus N (Hanhikaarto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: O Asuinrakennus O (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: P Lomarakennus P (Kuistila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: Q Asuinrakennus Q (Hautalehto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: R Lomarakennus R (Korpelanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: S Asuinrakennus S (Myllymäki)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: T Lomarakennus T (Kärsämäenneva)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

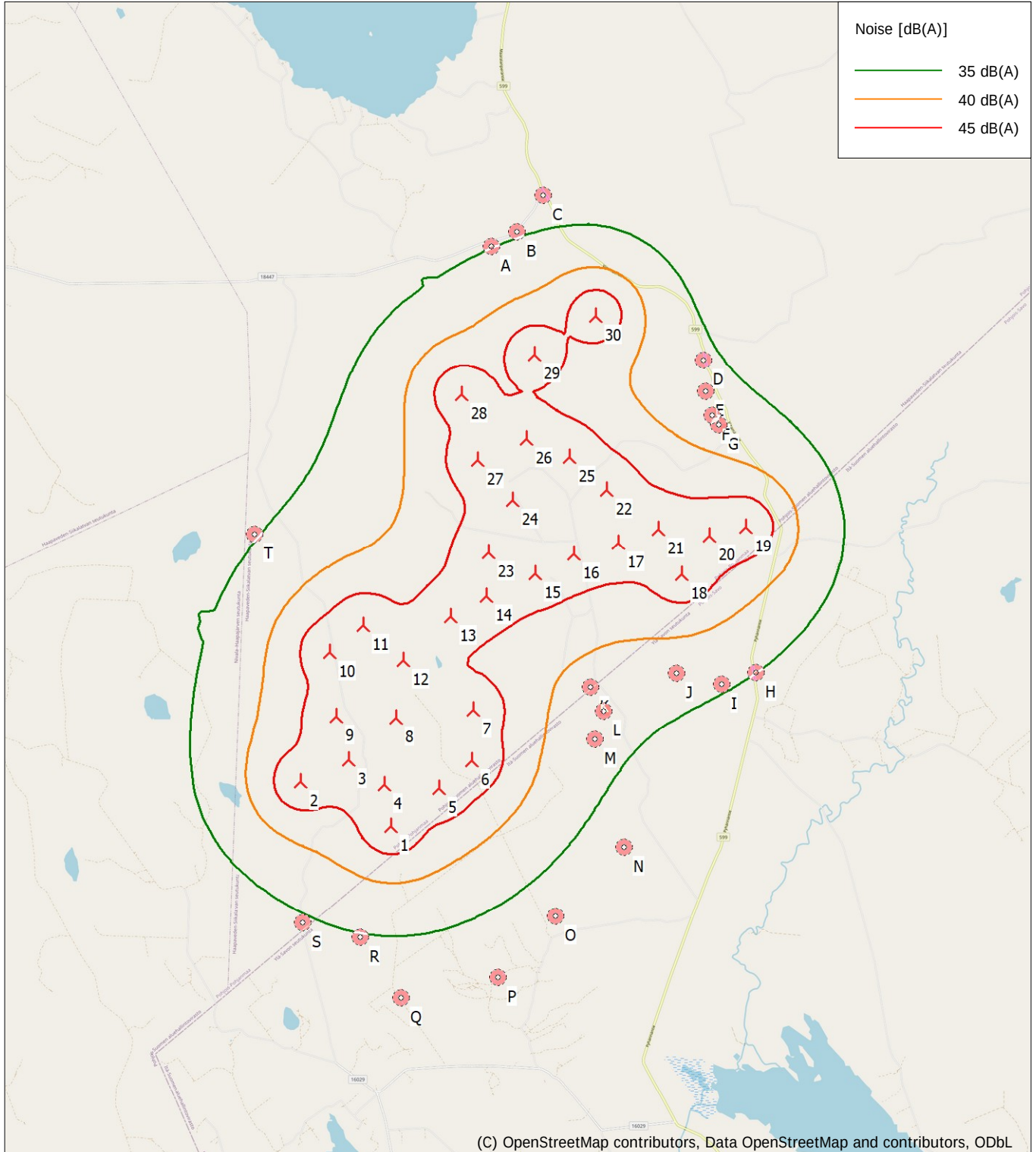
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Map 8,0 m/s

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB



Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 468 027 North: 7 086 900

New WTG Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

6.5.2024

Liite 2. Pilpänkankaan tuulivoimahanke - Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2 /2014 (VE2) Generic RD200–7.2 MW.

Project:

Pyhäntä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

1.3.2024 16.12/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE2_24xRD200xHH200_20240223_108.9dB

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhäntä_

Area type with hard ground: Vesistöt_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

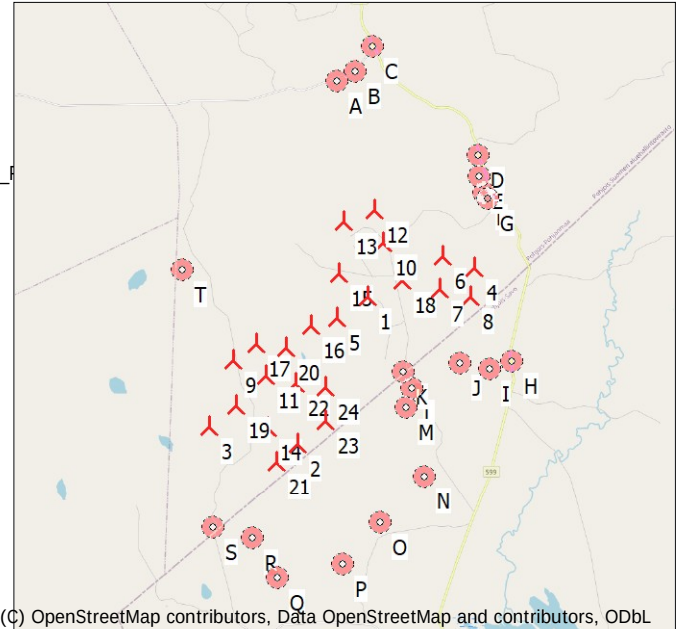
4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)



All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

East	North	Z	Row data/Description	WTG type		Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	Lwa,ref [dB(A)]
				Valid	Manufact.				Creator	Name		
1 468 261	7 086 867	156,9	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
2 466 361	7 082 992	166,9	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
3 464 036	7 083 492	147,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
4 471 111	7 087 617	166,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
5 467 461	7 086 317	159,1	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
6 470 261	7 087 917	162,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
7 470 186	7 087 042	157,2	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
8 471 011	7 086 842	163,3	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
9 464 686	7 085 217	154,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
10 468 686	7 088 267	159,3	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
11 465 536	7 084 792	162,6	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
12 468 449	7 089 139	165,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
13 467 636	7 088 842	165,8	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
14 465 586	7 083 442	162,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
15 467 511	7 087 492	165,9	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
16 466 761	7 086 117	170,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
17 465 286	7 085 667	158,8	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
18 469 186	7 087 292	156,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
19 464 736	7 084 017	151,7	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
20 466 111	7 085 542	160,4	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
21 465 786	7 082 517	166,3	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
22 466 336	7 084 592	161,7	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
23 467 111	7 083 592	159,6	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
24 467 136	7 084 492	159,4	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9

Calculation Results

Sound level

Noise sensitive area

Noise sensitive area		East	North	Z [m]	Immission height [m]	Demands		Distance to noise demand [m]
No.	Name					Noise [dB(A)]	From WTGs [dB(A)]	
A	Asuinrakennus A (Nurmiaho)	467 539	7 092 595	157,5	4,0	40,0	29,6	2 551
B	Asuinrakennus B (Kivikangas)	467 993	7 092 829	155,0	4,0	40,0	29,2	2 719
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	4,0	40,0	27,8	3 349
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	4,0	40,0	33,0	1 668
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	4,0	40,0	34,6	1 160
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	4,0	40,0	35,8	819
G	Lomarakennus G (Pääkkölä)	471 494	7 089 419	197,5	4,0	40,0	36,2	707
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	4,0	40,0	34,3	1 070
I	Asuinrakennus I (Nuutila)	471 499	7 084 904	165,2	4,0	40,0	35,0	987

To be continued on next page...

DECIBEL - Main Result

Calculation: Pilpankangas VE2_24xRD200xHH200_20240223_108.9dB

...continued from previous page

Noise sensitive area

No.	Name	East	North	Z [m]	Immission height [m]	Demands		Distance to noise demand [m]
						Noise [dB(A)]	From WTGs [dB(A)]	
J	Lomarakenus J (Ahmokangas)	470 723	7 085 089	155,0	4,0	40,0	36,9	657
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	4,0	40,0	38,3	561
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	4,0	40,0	37,1	939
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	4,0	40,0	36,7	867
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	4,0	40,0	32,5	1 948
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	4,0	40,0	32,4	1 823
P	Lomarakenus P (Kuistila)	467 531	7 079 776	162,3	4,0	40,0	31,1	2 149
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	4,0	40,0	30,9	2 078
R	Lomarakenus R (Korpelanperä)	465 124	7 080 510	140,0	4,0	40,0	34,2	1 119
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	4,0	40,0	33,7	1 364
T	Lomarakenus T (Kärsämäenneva)	463 349	7 087 611	152,5	4,0	40,0	33,8	1 481

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	5773	5967	6609	4747	4352	4145	4118	4219	3786	3037	2203	2691	3093	5038	6023	7129	7822	7090	7372	4969
2	9674	9970	10688	9008	8567	8296	8224	6106	5482	4839	3409	3387	3054	3518	3057	3423	3595	2774	3160	5514
3	9753	10140	10916	10093	9737	9550	9525	8215	7595	6874	5349	5469	5247	5894	5223	5102	4424	3175	2715	4176
4	6127	6073	6429	2956	2405	1998	1841	2702	2741	2558	3340	3598	4114	5725	7238	8620	9746	9294	9790	7763
5	6278	6533	7225	5684	5306	5111	5087	4788	4278	3485	2261	2715	2983	4839	5572	6542	7073	6260	6476	4311
6	5412	5410	5841	2825	2327	2019	1942	3360	3257	2866	3220	3577	4099	5884	7273	8587	9575	9015	9426	6919
7	6151	6188	6659	3680	3164	2820	2712	2721	2509	2026	2379	2712	3235	5006	6406	7737	8773	8265	8730	6861
8	6719	6704	7106	3735	3185	2780	2621	2051	1998	1777	2672	2880	3386	4949	6480	7877	9048	8647	9190	7701
9	7910	8298	9076	8456	8143	8000	7999	7407	6820	6038	4530	4800	4752	5972	5825	6140	5886	4728	4477	2742
10	4477	4614	5211	3433	3116	3005	3034	4651	4384	3775	3431	3898	4364	6303	7418	8570	9285	8537	8779	5378
11	8055	8403	9159	8113	7753	7566	7543	6563	5964	5195	3668	3903	3824	5027	4957	5399	5360	4302	4261	3568
12	3573	3717	4334	3129	2949	2967	3058	5440	5219	4645	4330	4799	5261	7203	8289	9409	10052	9248	9421	5324
13	3754	4002	4703	3989	3813	3820	3900	5819	5516	4860	4265	4751	5164	7109	8043	9067	9579	8703	8803	4461
14	9358	9690	10433	9093	8687	8453	8403	6714	6091	5394	3891	3964	3712	4391	3931	4151	4009	2969	3048	4731
15	5102	5358	6055	4829	4523	4405	4424	5168	4754	4011	3116	3602	3960	5881	6721	7717	8231	7379	7528	4164
16	6524	6823	7549	6310	5957	5783	5770	5427	4891	4093	2739	3146	3317	5044	5560	6388	6745	5842	5963	3725
17	7284	7655	8425	7706	7393	7252	7253	6830	6260	5467	3996	4315	4336	5744	5814	6305	6250	5160	5029	2745
18	5552	5663	6224	3864	3427	3182	3138	3640	3324	2686	2417	2862	3352	5267	6474	7697	8548	7906	8261	5846
19	9024	9394	10161	9227	8866	8677	8651	7435	6821	6082	4549	4706	4529	5386	4951	5080	4702	3529	3300	3852
20	7195	7525	8270	7176	6825	6649	6633	5997	5426	4634	3163	3490	3536	5041	5284	5939	6110	5129	5169	3451
21	10229	10544	11276	9721	9287	9024	8955	6814	6192	5566	4152	4114	3758	3993	3221	3250	3078	2114	2418	5647
22	8092	8401	9130	7727	7329	7106	7063	5778	5172	4414	2881	3090	2999	4255	4343	4963	5180	4259	4418	4247
23	9012	9278	9972	8104	7650	7368	7290	5204	4580	3909	2454	2462	2181	3056	3093	3840	4352	3668	4117	5505
24	8112	8380	9077	7329	6897	6639	6577	4993	4382	3636	2102	2287	2198	3575	3904	4733	5224	4462	4793	4906

Project:

Pyhäntä_Pilpankangas

Licensed user:

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Osmontie 34, PO Box 950
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Calculated:
1.3.2024 16.12/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE2_24xRD200xHH200_20240223_108.9dB

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhäntä_Pilpankangas_8.w2r (9)

Area type with hard ground: Vesistöt_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: Generic RD200 HH200 7200 200.0 !O!

Noise: V172 - 7,2 MW PO7200 STE + 2dB

Source Source/Date Creator Edited

Vestas 30.6.2022 USER 26.2.2024 13.43

DMS no.: 0128-4336_00

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	200,0	8,0	108,9	No	92,4	100,0	103,3	103,5	101,9	97,4	89,9	79,2

Noise sensitive area: A Asuinrakennus A (Nurmiaho)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: B Asuinrakennus B (Kivikangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: C Asuinrakennus C (Koukkula)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE2_24xRD200xHH200_20240223_108.9dB

Noise sensitive area: D Asuinrakennus D (Konola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: E Asuinrakennus E (Piippo)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: F Asuinrakennus F (Pääkkö)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: G Lomarakennus G (Pääkkölä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: H Asuinrakennus H (Peltola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: I Asuinrakennus I (Nuuttila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: J Lomarakennus J (Ahmokangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: K Asuinrakennus K (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: L Asuinrakennus L (Tuohipuro)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE2_24xRD200xHH200_20240223_108.9dB

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: M Asuinrakennus M (Pilpanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: N Asuinrakennus N (Hanhikaarto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: O Asuinrakennus O (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: P Lomarakennus P (Kuistila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: Q Asuinrakennus Q (Hautalehto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: R Lomarakennus R (Korpelanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: S Asuinrakennus S (Myllymäki)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: T Lomarakennus T (Kärsämäenneva)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

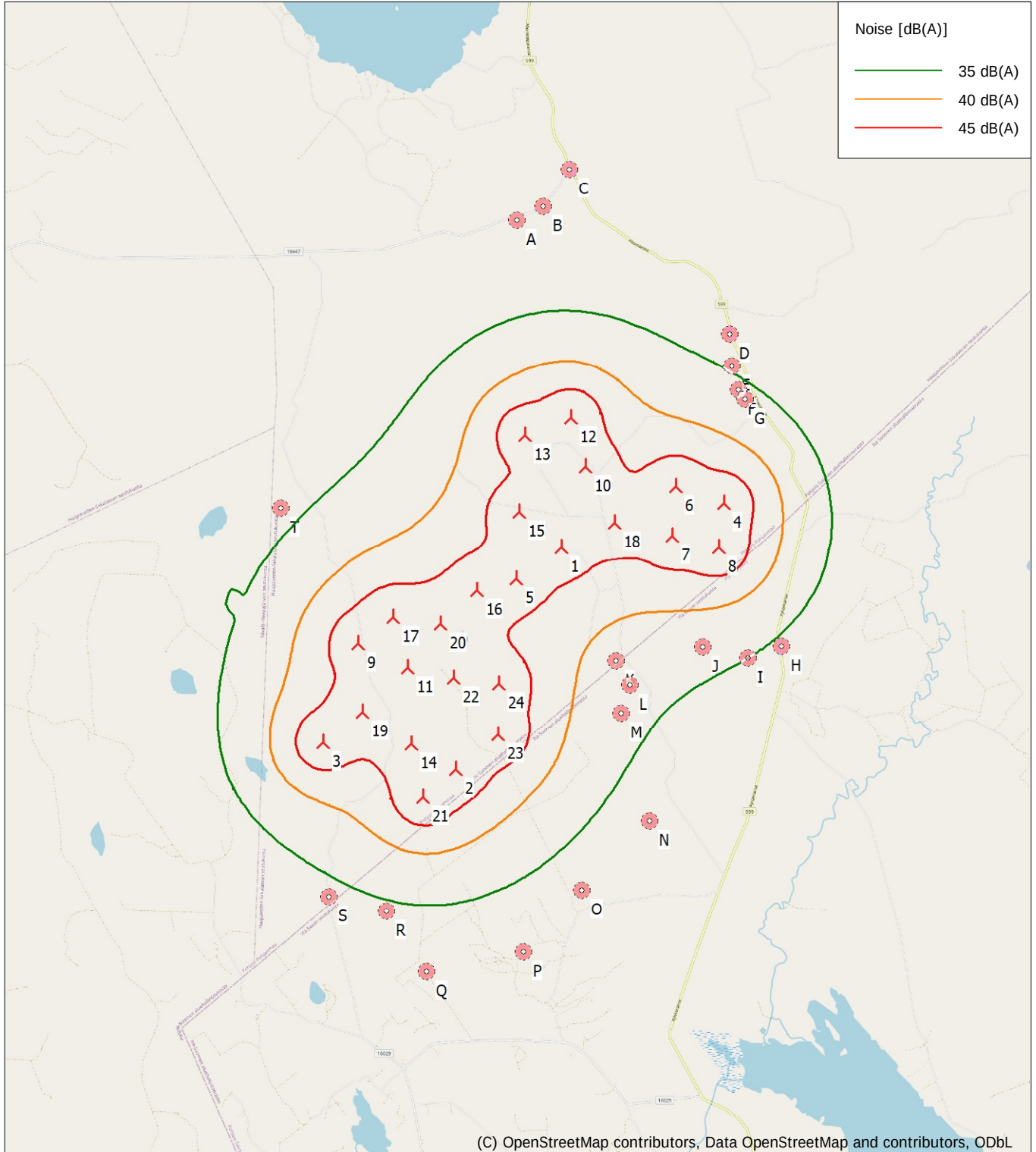
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Map 8,0 m/s

Calculation: Pilpankangas VE2_24xRD200xHH200_20240223_108.9dB



0 1 2 3 4 km

Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 467 574 North: 7 086 456
New WTG Noise sensitive area
Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

6.5.2024

Liite 3. Pilpänkankaan tuulivoimahanke - Melun leviämismallinnuksen tulokset ISO 9613-2, YM 2 /2014 (VE3) Generic RD200–7.2 MW.

Project:

Pyhätä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

1.3.2024 15.31/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_108.9dB

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhätä_

Area type with hard ground: Vesistöt_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

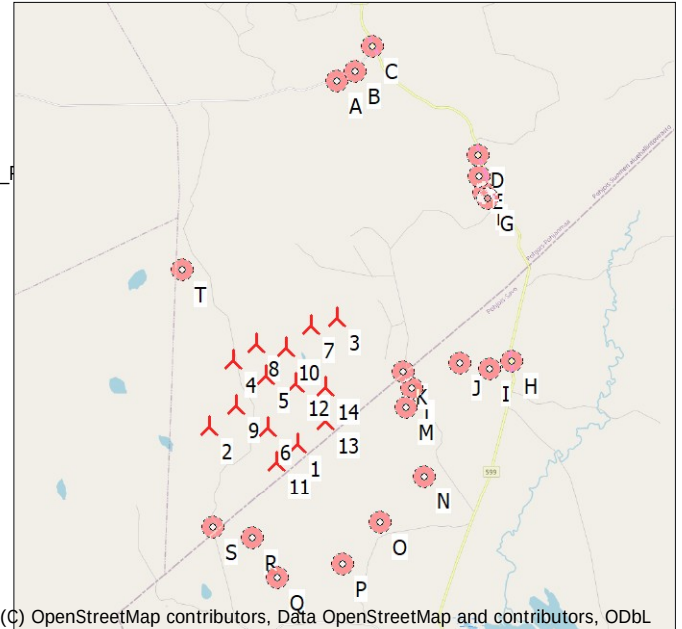
4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)



All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

East	North	Z	Row data/Description	WTG type		Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	Lwa_ref [dB(A)]
				Valid	Manufact.	Type-generator			Creator	Name		
1 466 361	7 082 992	166,9	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
2 464 036	7 083 492	147,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
3 467 461	7 086 317	159,1	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
4 464 686	7 085 217	154,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
5 465 536	7 084 792	162,6	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
6 465 586	7 083 442	162,5	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
7 466 761	7 086 117	170,0	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
8 465 286	7 085 667	158,8	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
9 464 736	7 084 017	151,7	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
10 466 111	7 085 542	160,4	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
11 465 786	7 082 517	166,3	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
12 466 336	7 084 592	161,7	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
13 467 111	7 083 592	159,6	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9
14 467 136	7 084 492	159,4	Generic RD200 HH200 720...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	USER	V172 - 7,2 MW PO7200 STE + 2dB	8,0	108,9

Calculation Results

Sound level

Noise sensitive area

No.	Name	East	North	Z [m]	Immission height [m]	Noise [dB(A)]	From WTGs [dB(A)]	Distance to noise demand [m]
A	Asuinrakennus A (Nurmiaho)	467 539	7 092 595	157,5	4,0	40,0	23,6	5 283
B	Asuinrakennus B (Kivikangas)	467 993	7 092 829	155,0	4,0	40,0	23,2	5 555
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	4,0	40,0	22,1	6 258
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	4,0	40,0	24,0	4 777
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	4,0	40,0	24,7	4 402
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	4,0	40,0	25,0	4 208
G	Lomarakenus G (Pääkkölä)	471 494	7 089 419	197,5	4,0	40,0	25,1	4 185
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	4,0	40,0	27,1	3 804
I	Asuinrakennus I (Nuuttila)	471 499	7 084 904	165,2	4,0	40,0	28,4	3 217
J	Lomarakenus J (Ahmokaarto)	470 723	7 085 089	155,0	4,0	40,0	30,5	2 460
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	4,0	40,0	35,6	927
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	4,0	40,0	34,7	1 121
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	4,0	40,0	35,1	980
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	4,0	40,0	31,3	1 994
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	4,0	40,0	31,8	1 852
P	Lomarakenus P (Kuistila)	467 531	7 079 776	162,3	4,0	40,0	30,5	2 167
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	4,0	40,0	30,5	2 092

To be continued on next page...

DECIBEL - Main Result

Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_108.9dB

...continued from previous page

Noise sensitive area

No.	Name	East	North	Z [m]	Immission height [m]	Demands		Distance to noise demand [m]
						Noise [dB(A)]	Sound level From WTGs [dB(A)]	
R	Lomarakenus R (Korpelanperä)	465 124	7 080 510	140,0	4,0	40,0	33,9	1 132
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	4,0	40,0	33,5	1 378
T	Lomarakenus T (Kärsämäenneva)	463 349	7 087 611	152,5	4,0	40,0	32,9	1 534

Distances (m)

WTG														
NSA	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	9674	9753	6278	7910	8055	9358	6524	7284	9024	7195	10229	8092	9012	8112
B	9970	10140	6533	8298	8403	9690	6823	7655	9394	7525	10544	8401	9278	8380
C	10688	10916	7225	9076	9159	10433	7549	8425	10161	8270	11276	9130	9972	9077
D	9008	10093	5684	8456	8113	9093	6310	7706	9227	7176	9721	7727	8104	7329
E	8567	9737	5306	8143	7753	8687	5957	7393	8866	6825	9287	7329	7650	6897
F	8296	9550	5111	8000	7566	8453	5783	7252	8677	6649	9024	7106	7368	6639
G	8224	9525	5087	7999	7543	8403	5770	7253	8651	6633	8955	7063	7290	6577
H	6106	8215	4788	7407	6563	6714	5427	6830	7435	5997	6814	5778	5204	4993
I	5482	7595	4278	6820	5964	6091	4891	6260	6821	5426	6192	5172	4580	4382
J	4839	6874	3485	6038	5195	5394	4093	5467	6082	4634	5566	4414	3909	3636
K	3409	5349	2261	4530	3668	3891	2739	3996	4549	3163	4152	2881	2454	2102
L	3387	5469	2715	4800	3903	3964	3146	4315	4706	3490	4114	3090	2462	2287
M	3054	5247	2983	4752	3824	3712	3317	4336	4529	3536	3758	2999	2181	2198
N	3518	5894	4839	5972	5027	4391	5044	5744	5386	5041	3993	4255	3056	3575
O	3057	5223	5572	5825	4957	3931	5560	5814	4951	5284	3221	4343	3093	3904
P	3423	5102	6542	6140	5399	4151	6388	6305	5080	5939	3250	4963	3840	4733
Q	3595	4424	7073	5886	5360	4009	6745	6250	4702	6110	3078	5180	4352	5224
R	2774	3175	6260	4728	4302	2969	5842	5160	3529	5129	2114	4259	3668	4462
S	3160	2715	6476	4477	4261	3048	5963	5029	3300	5169	2418	4418	4117	4793
T	5514	4176	4311	2742	3568	4731	3725	2745	3852	3451	5647	4247	5505	4906

Project:

Pyhäntä_Pilpankangas

Licensed user:

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Calculated:
1.3.2024 15.31/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_108.9dB

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhäntä_Pilpankangas_8.w2r (9)

Area type with hard ground: Vesistöt_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: Generic RD200 HH200 7200 200.0 !O!

Noise: V172 - 7,2 MW PO7200 STE + 2dB

Source Source/Date Creator Edited

Vestas 30.6.2022 USER 26.2.2024 13.43

DMS no.: 0128-4336_00

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
					[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	200,0	8,0	108,9	No	92,4	100,0	103,3	103,5	101,9	97,4	89,9	79,2

Noise sensitive area: A Asuinrakennus A (Nurmiaho)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: B Asuinrakennus B (Kivikangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: C Asuinrakennus C (Koukkula)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_108.9dB

Noise sensitive area: D Asuinrakennus D (Konola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: E Asuinrakennus E (Piippo)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: F Asuinrakennus F (Pääkkö)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: G Lomarakennus G (Pääkkölä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: H Asuinrakennus H (Peltola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: I Asuinrakennus I (Nuuttila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: J Lomarakennus J (Ahmokangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: K Asuinrakennus K (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: L Asuinrakennus L (Tuohipuro)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_108.9dB

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: M Asuinrakennus M (Pilpanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: N Asuinrakennus N (Hanhikaarto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: O Asuinrakennus O (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: P Lomarakennus P (Kuistila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: Q Asuinrakennus Q (Hautalehto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: R Lomarakennus R (Korpelanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: S Asuinrakennus S (Myllymäki)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: T Lomarakennus T (Kärsämäenneva)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

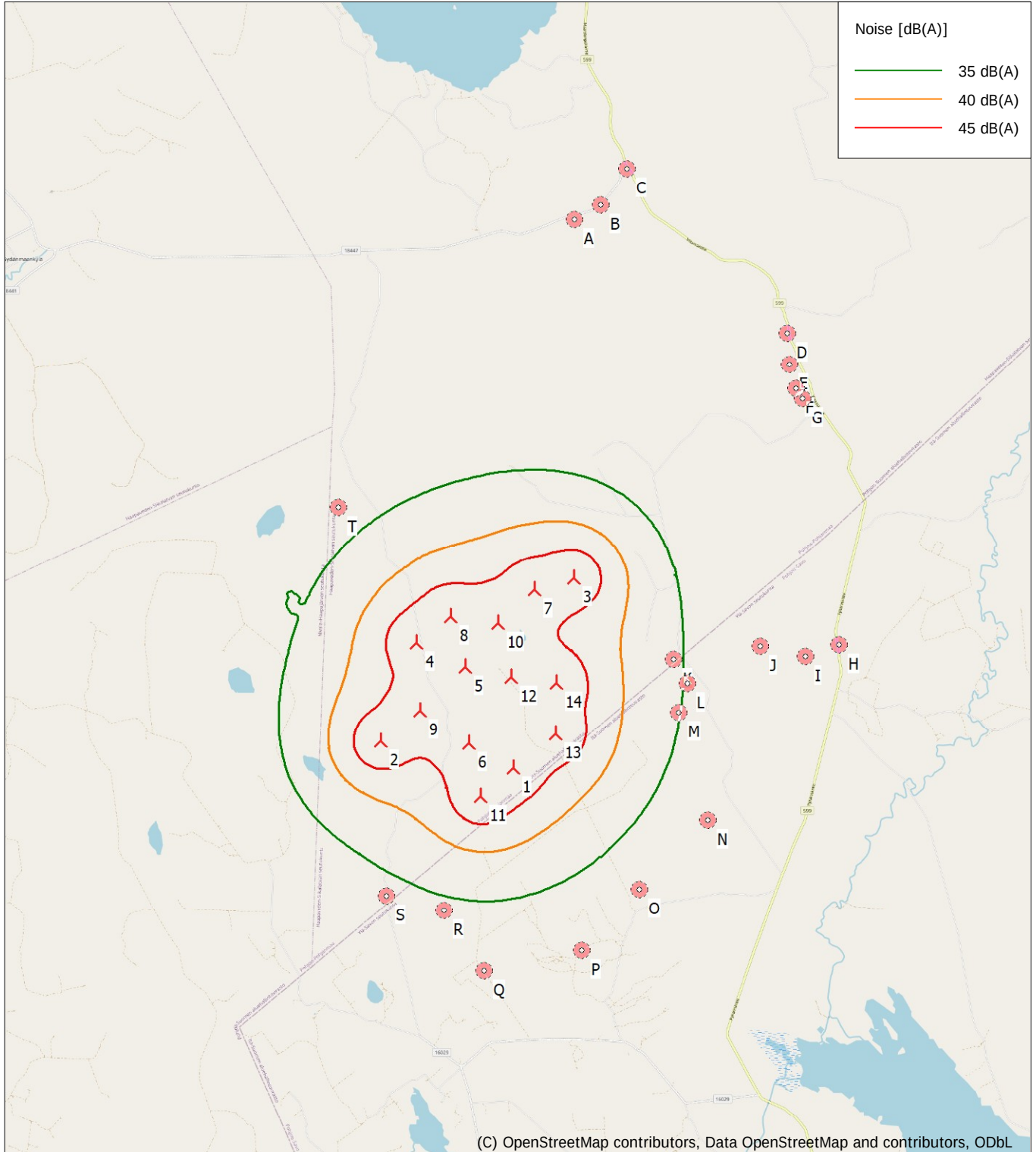
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Map 8,0 m/s

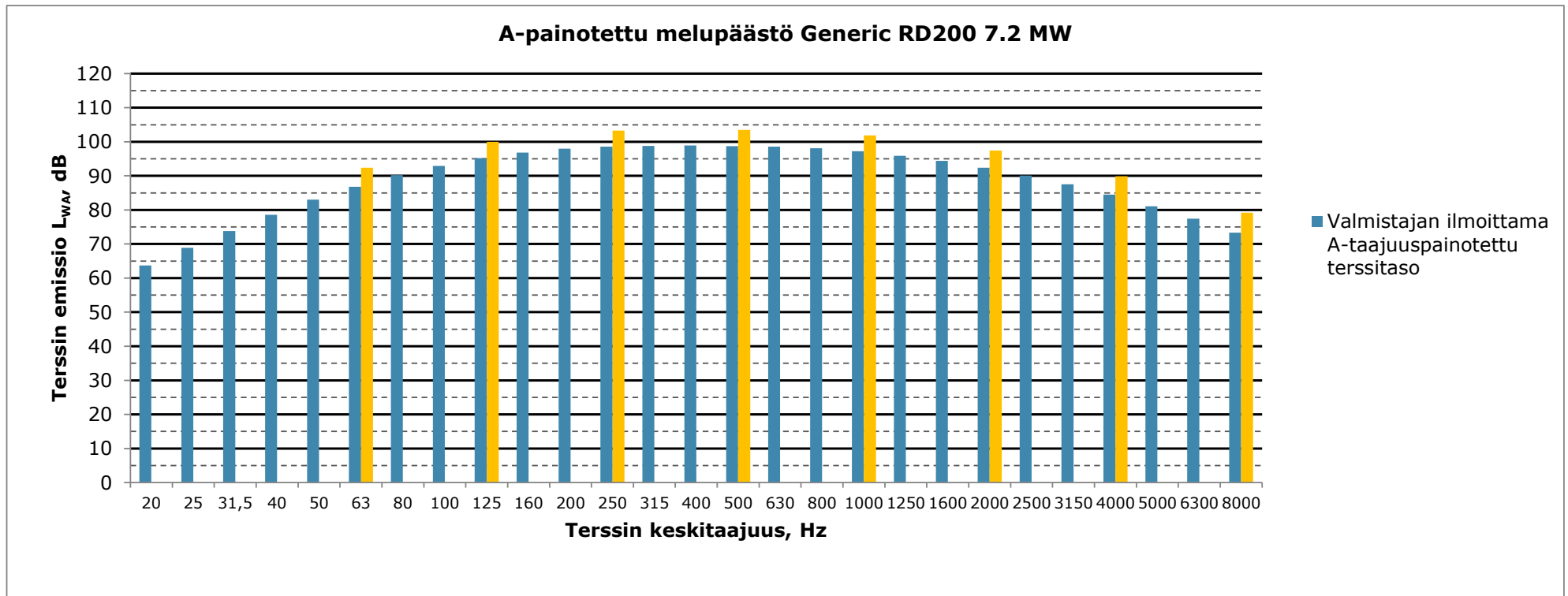
Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_108.9dB

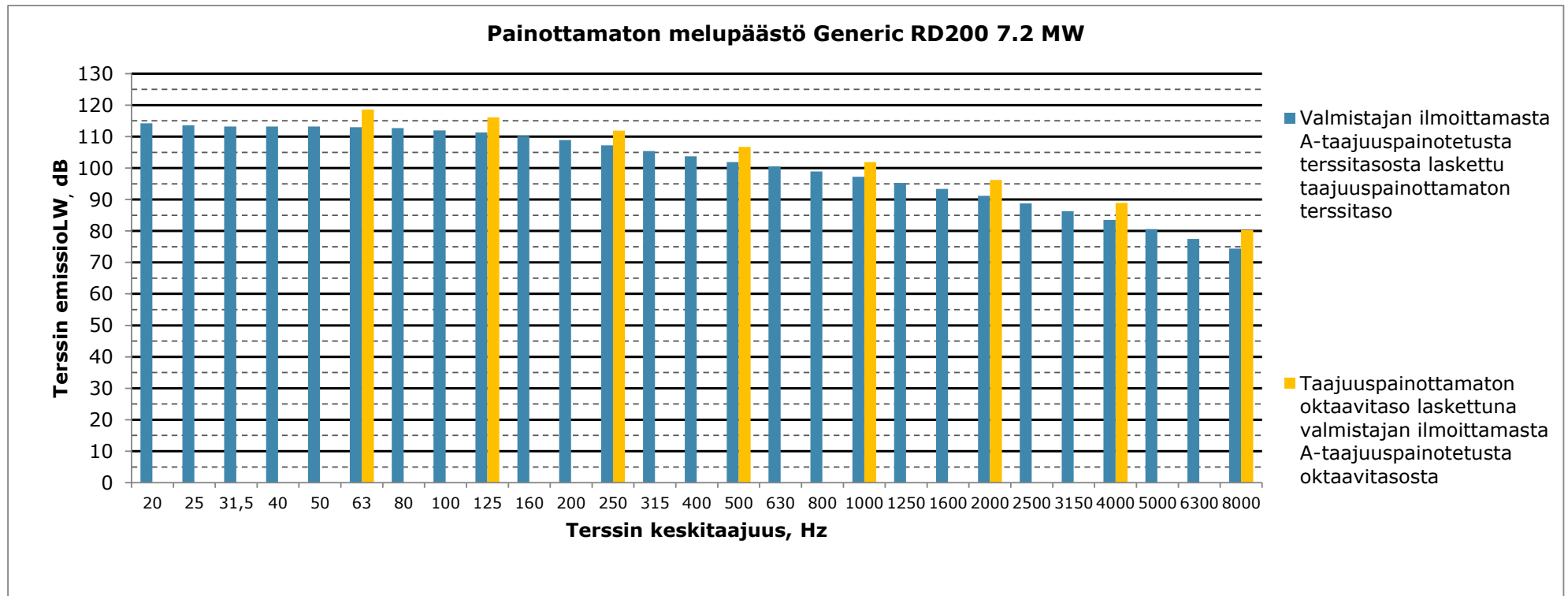


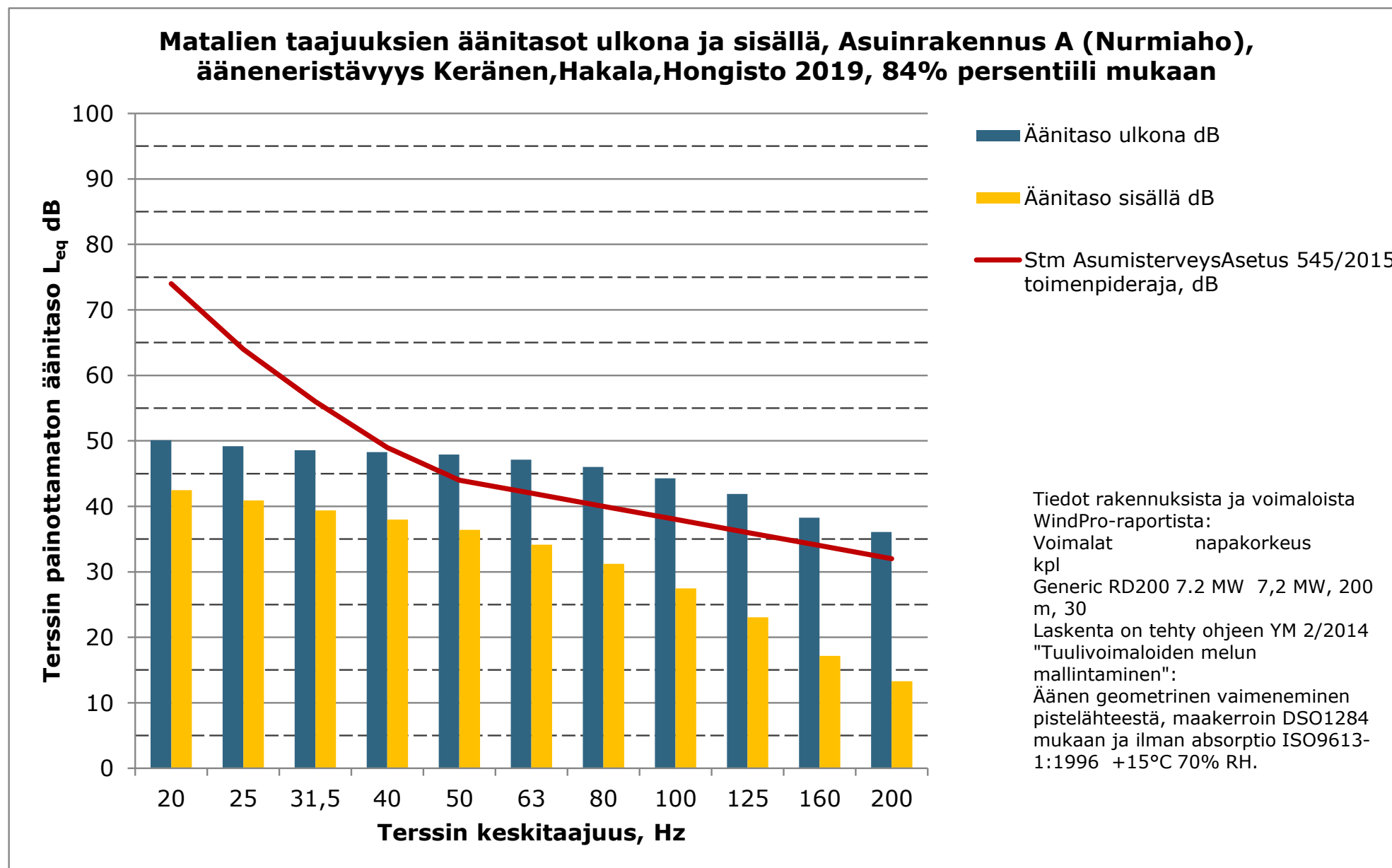
Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 466 564 North: 7 086 456
New WTG Noise sensitive area
Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

6.5.2024

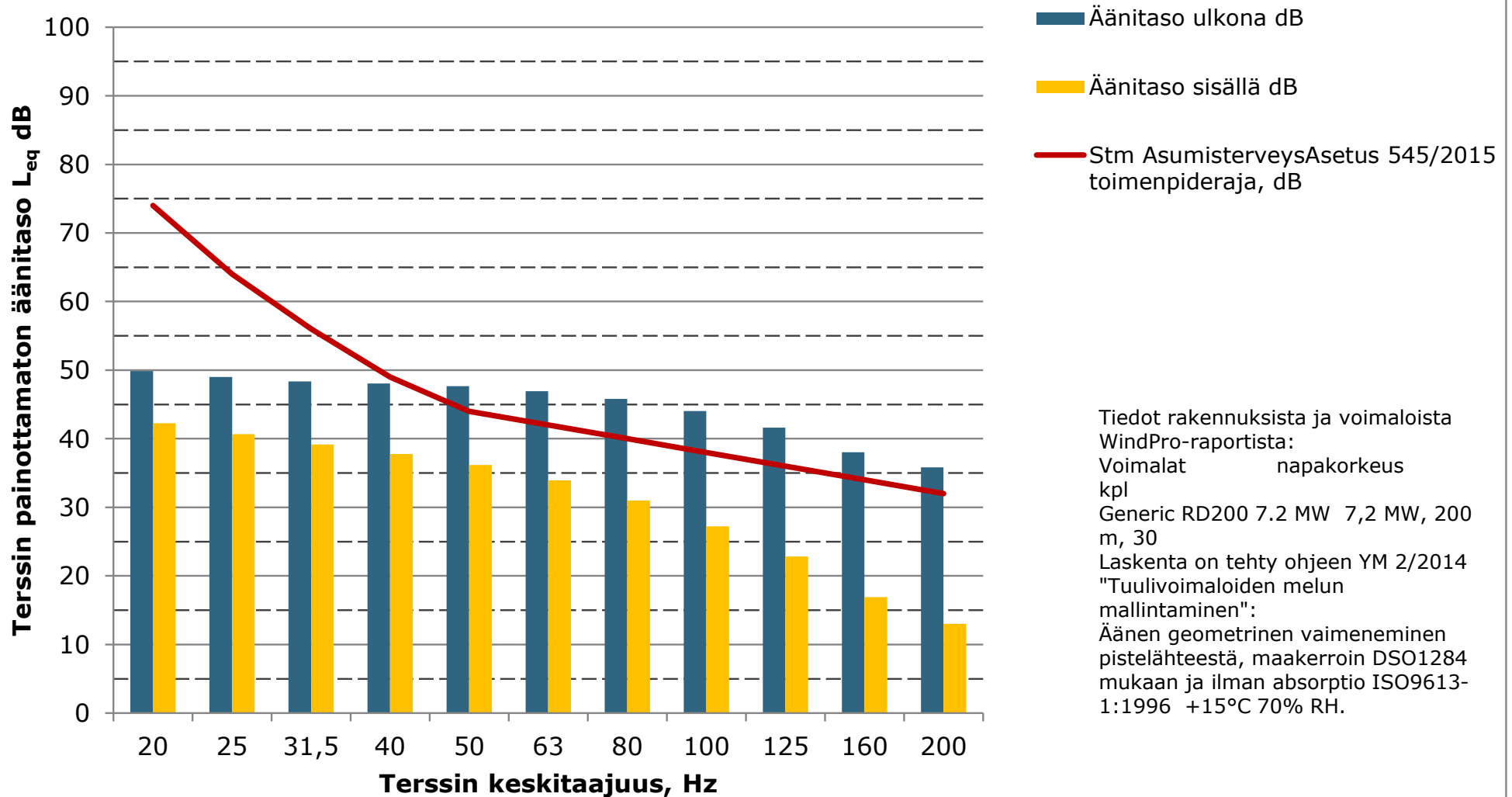
**Liite 4. Pilpänkankaan tuulivoimahanke – matalataajuisen melun rakennuskohtaiset arvot VE1
Generic RD200–7.2 MW.**



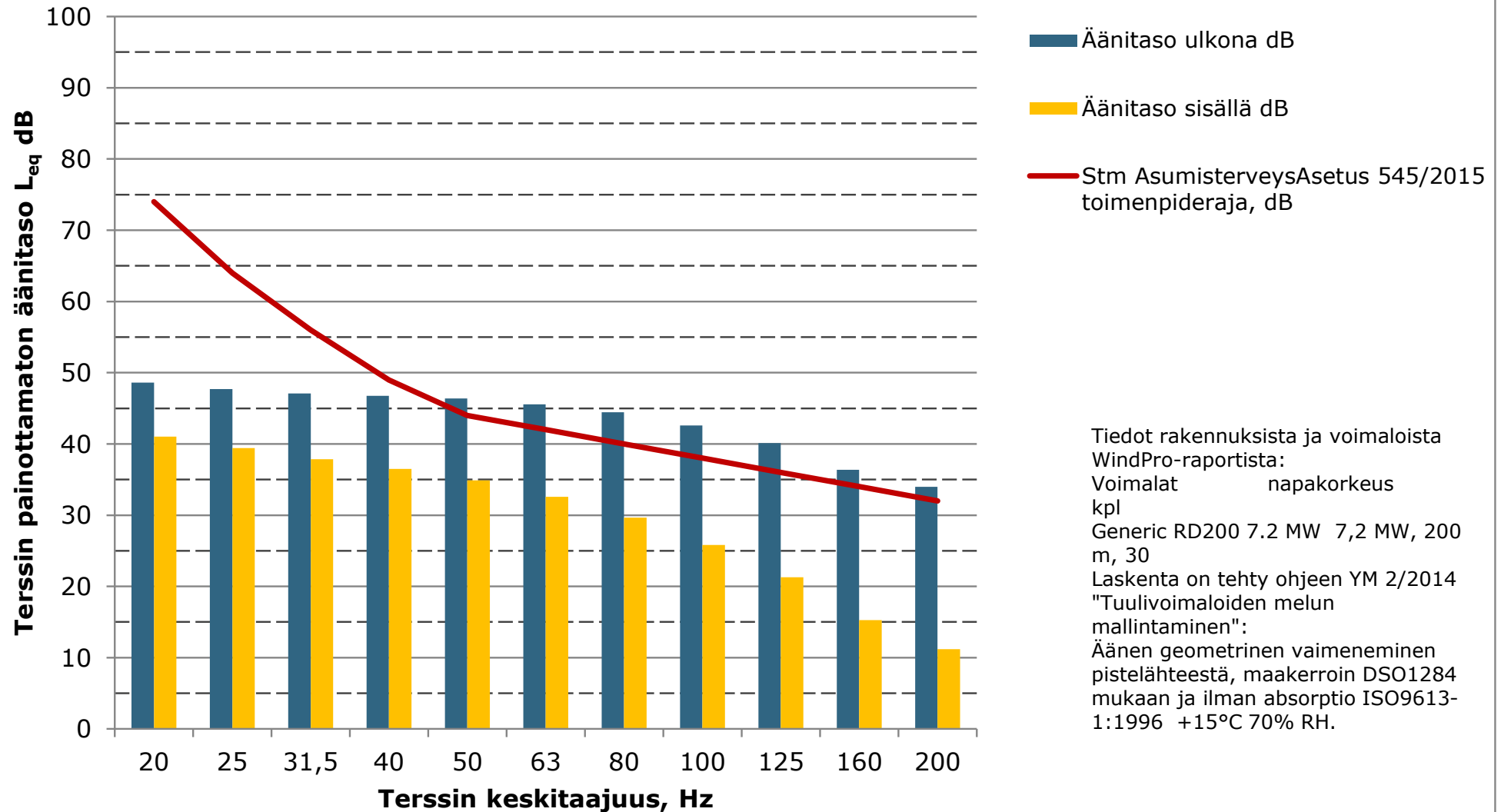


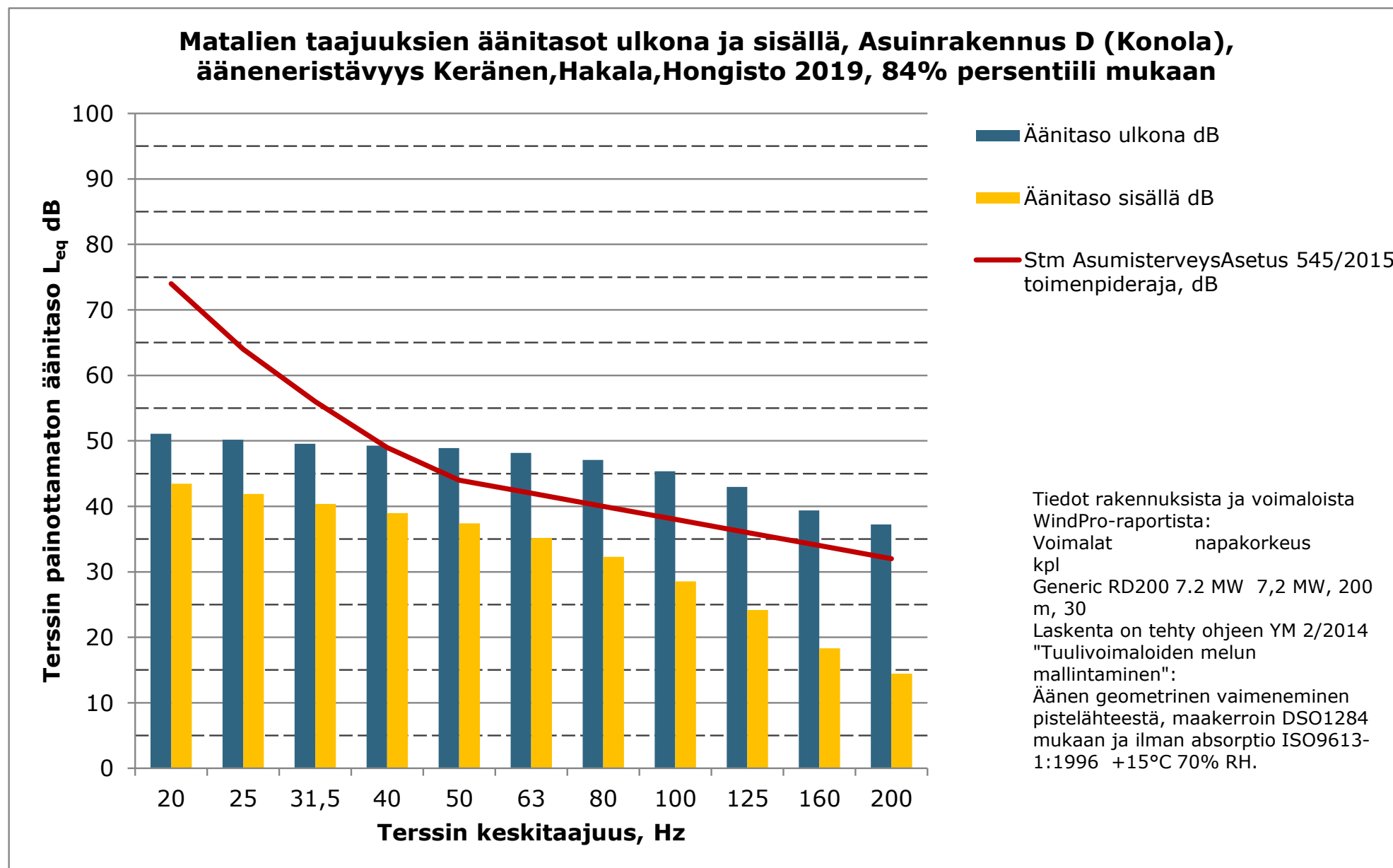


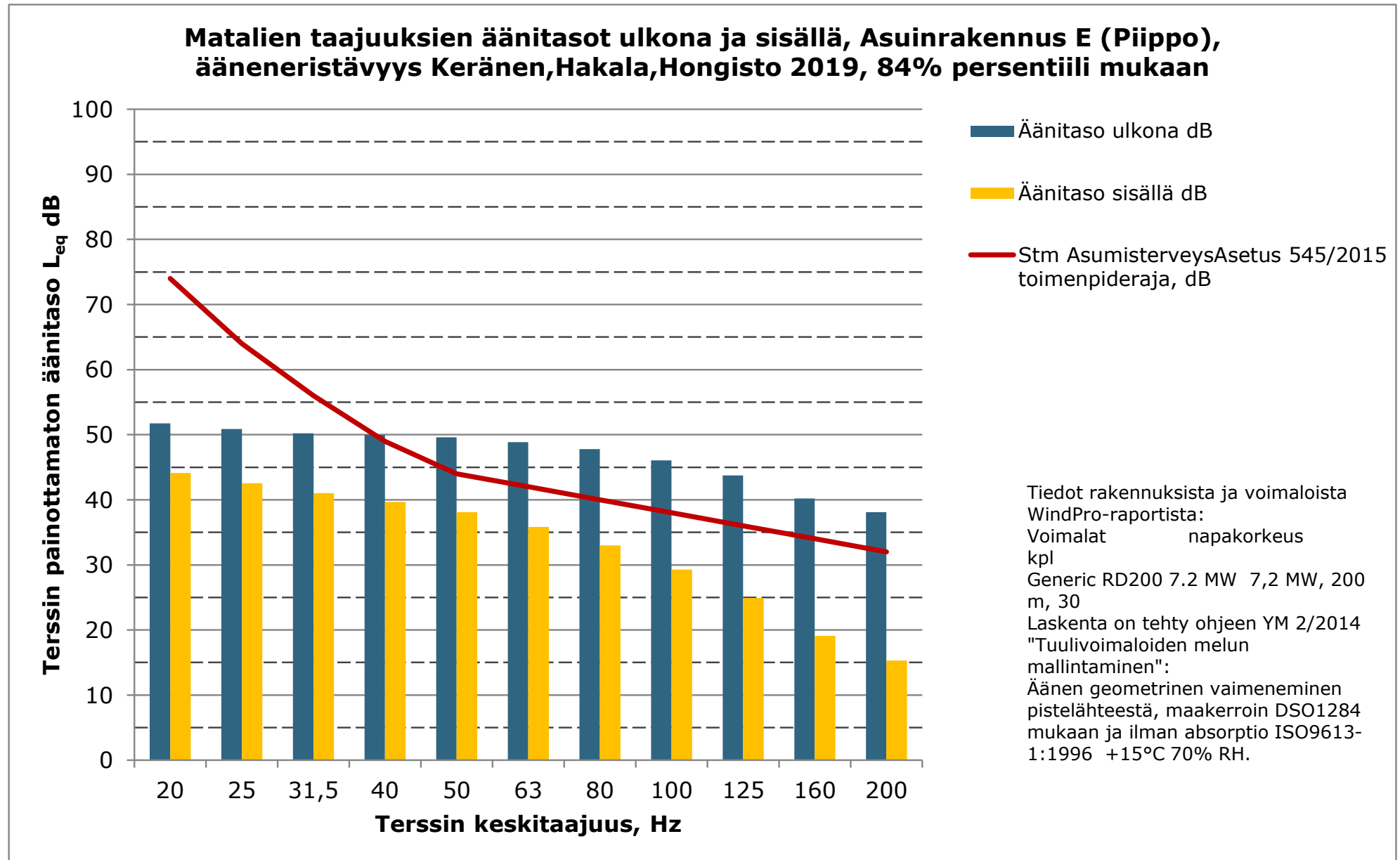
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus B
(Kivikangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**



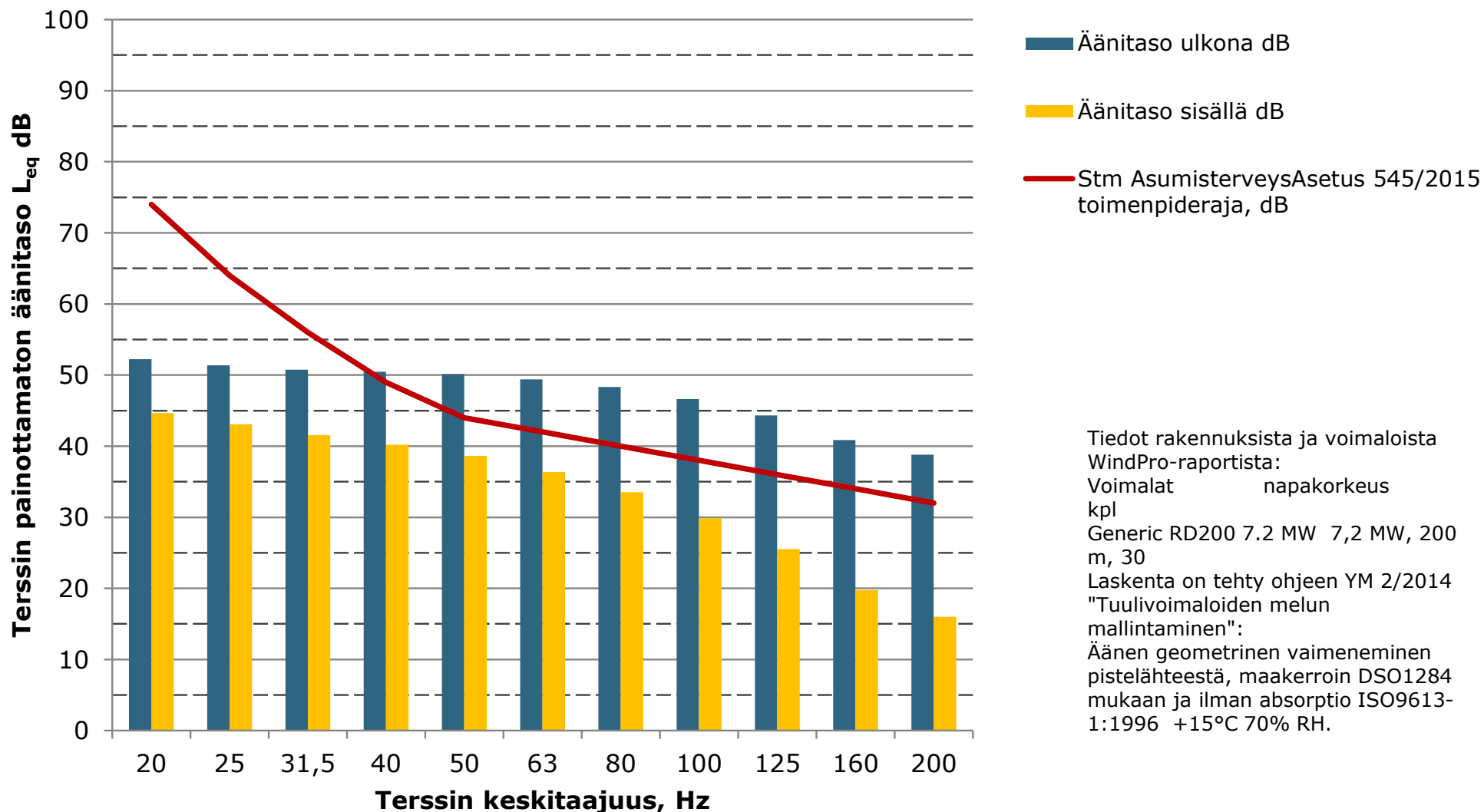
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C (Koukkula), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

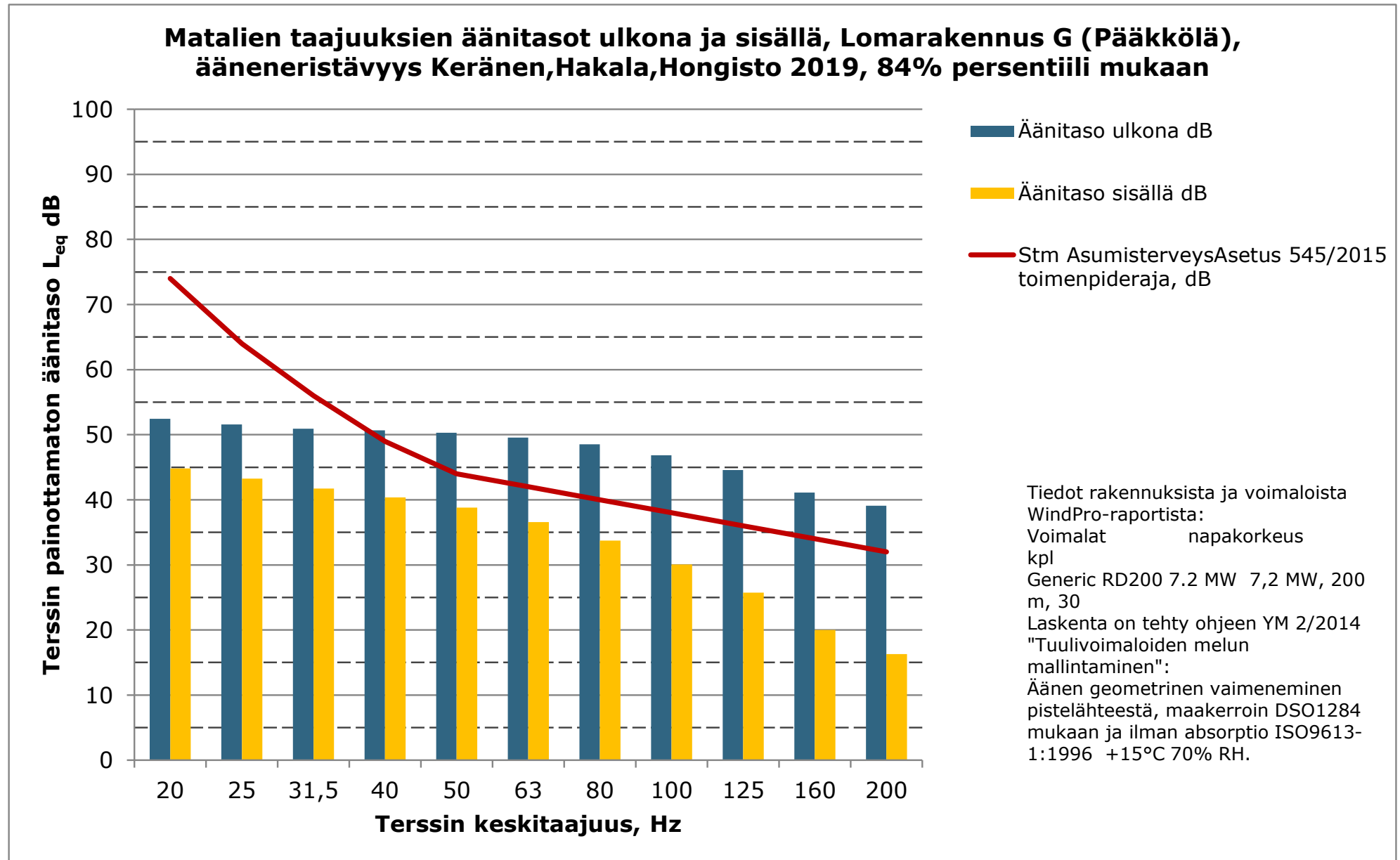




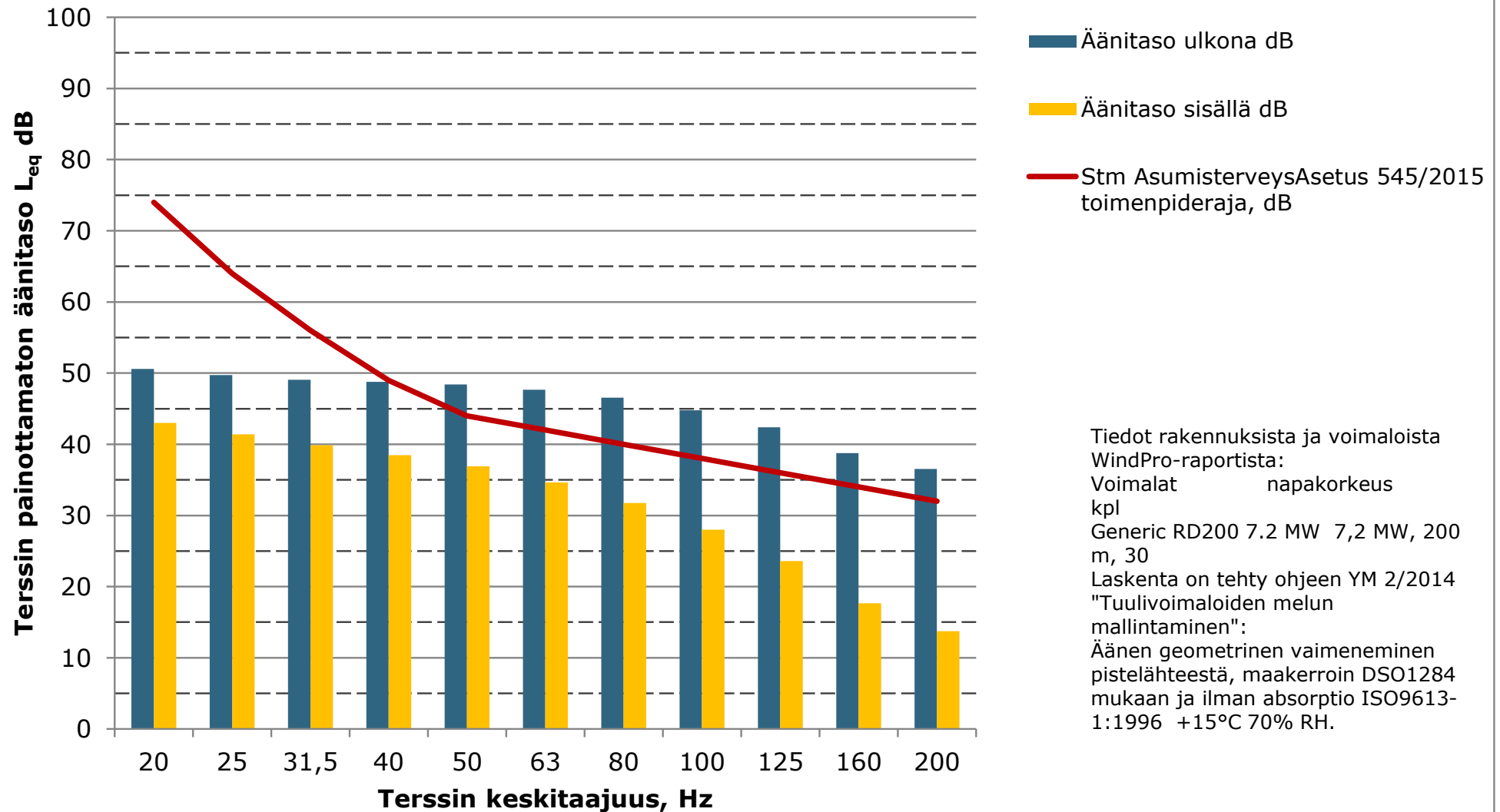


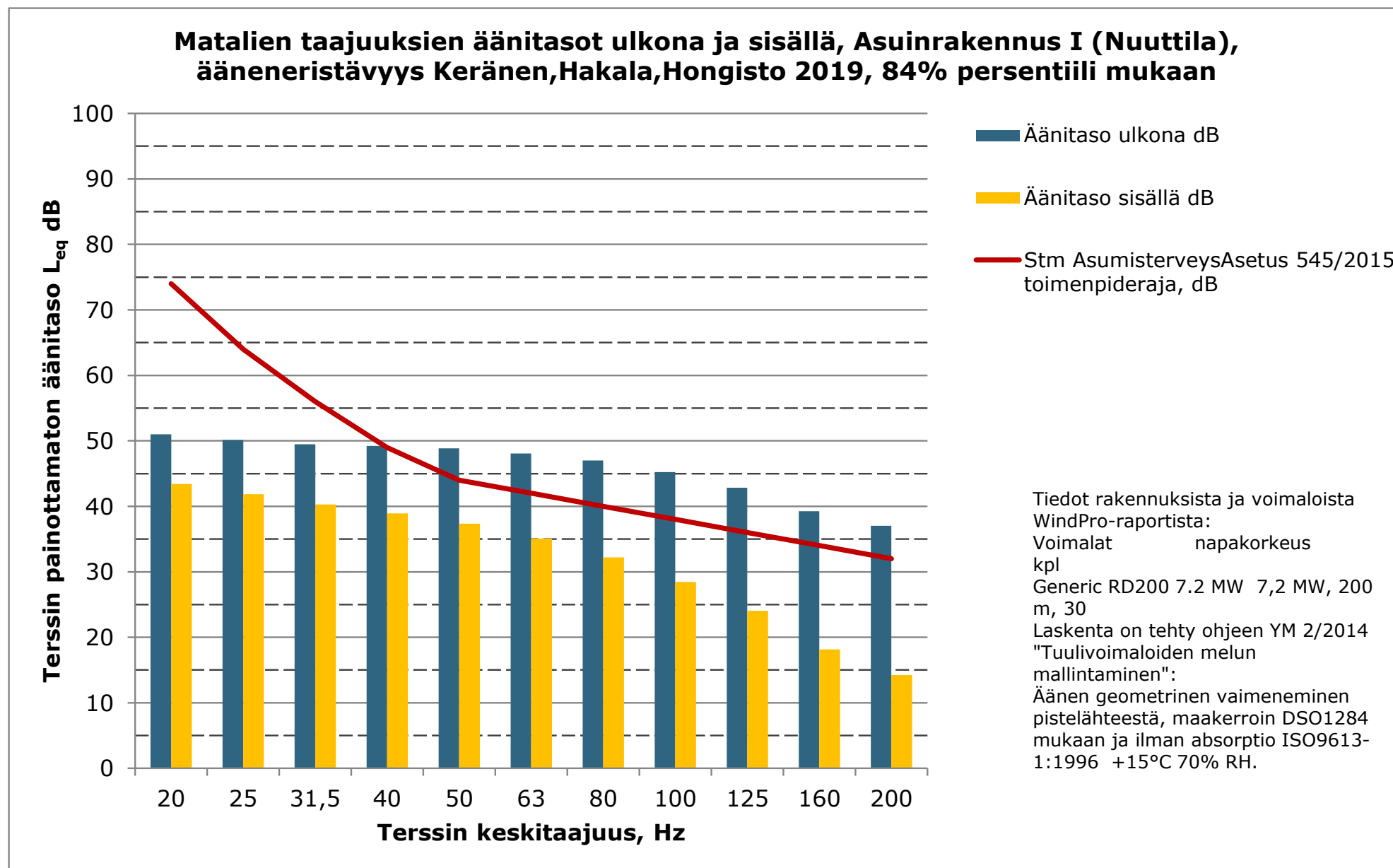
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Pääkkö), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



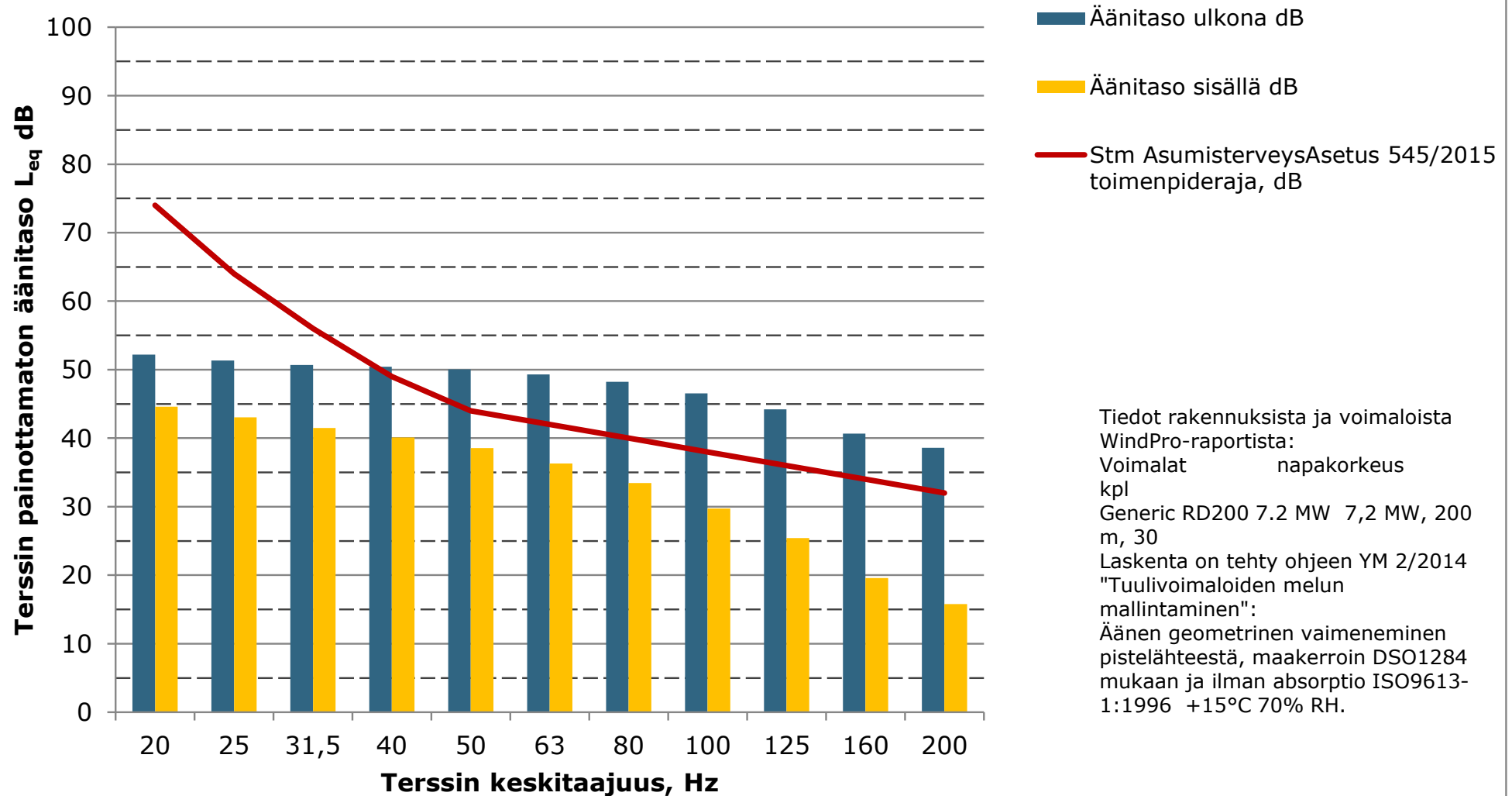


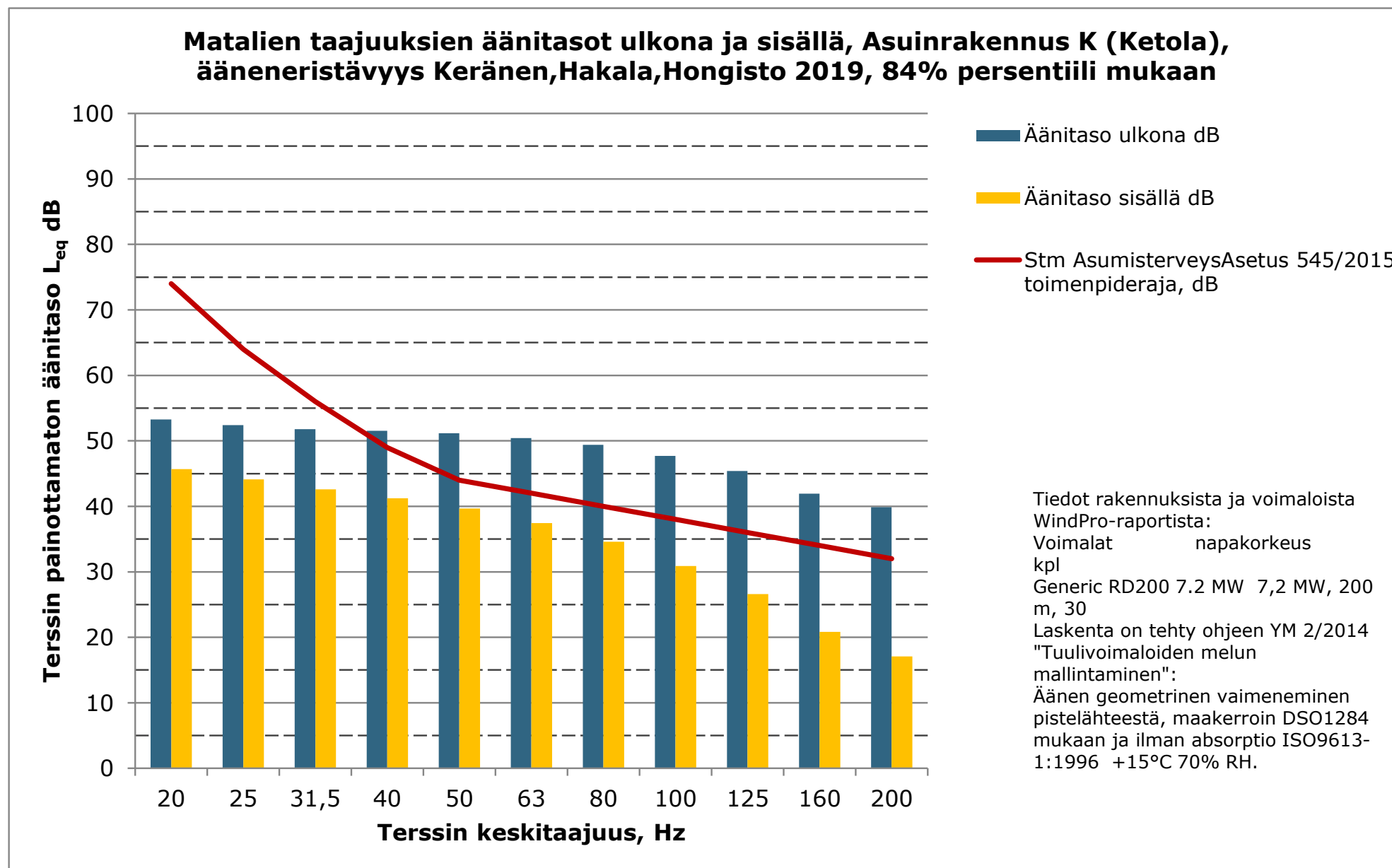
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Peltola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



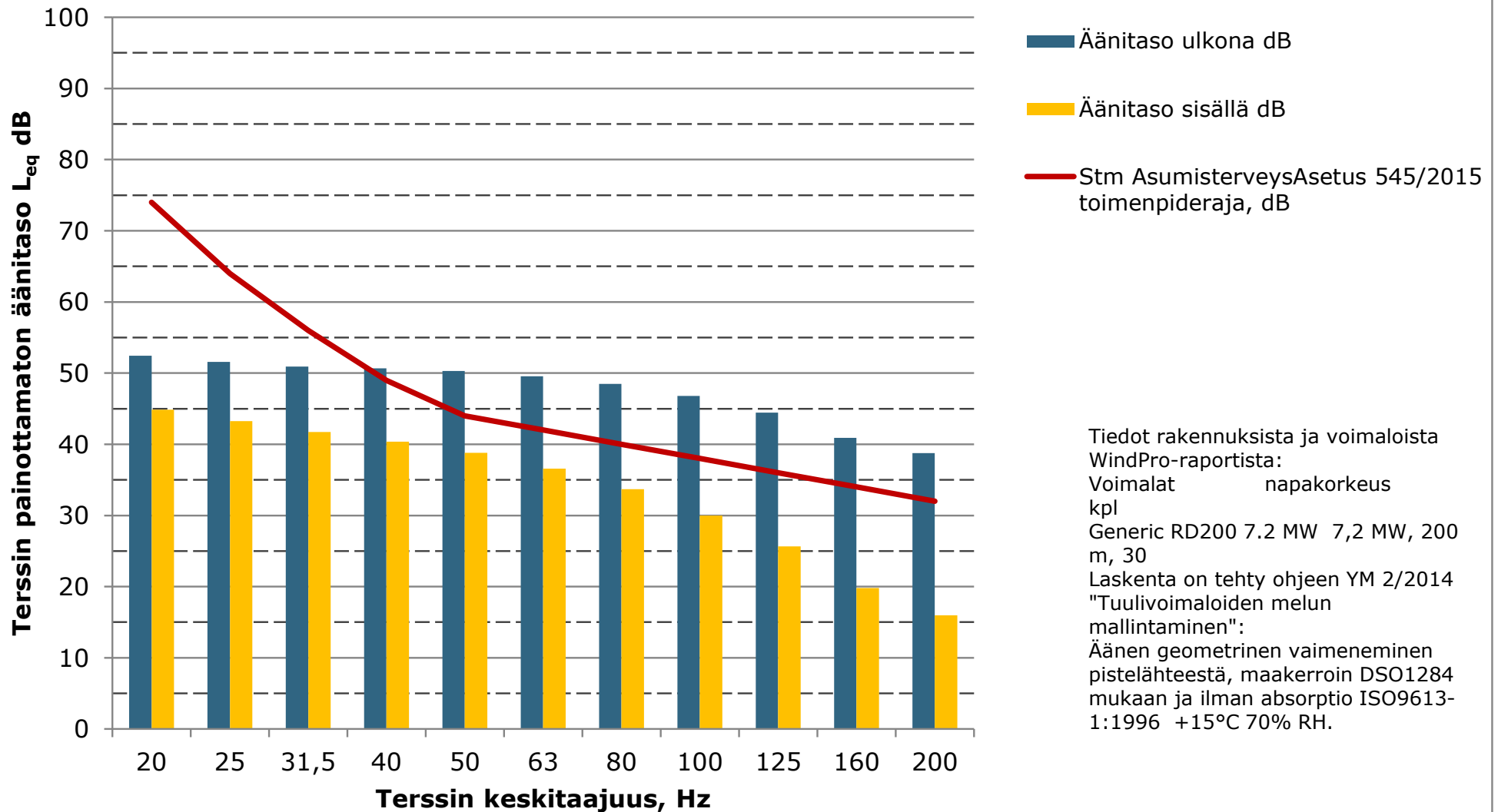


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakenus J
(Ahmokangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**

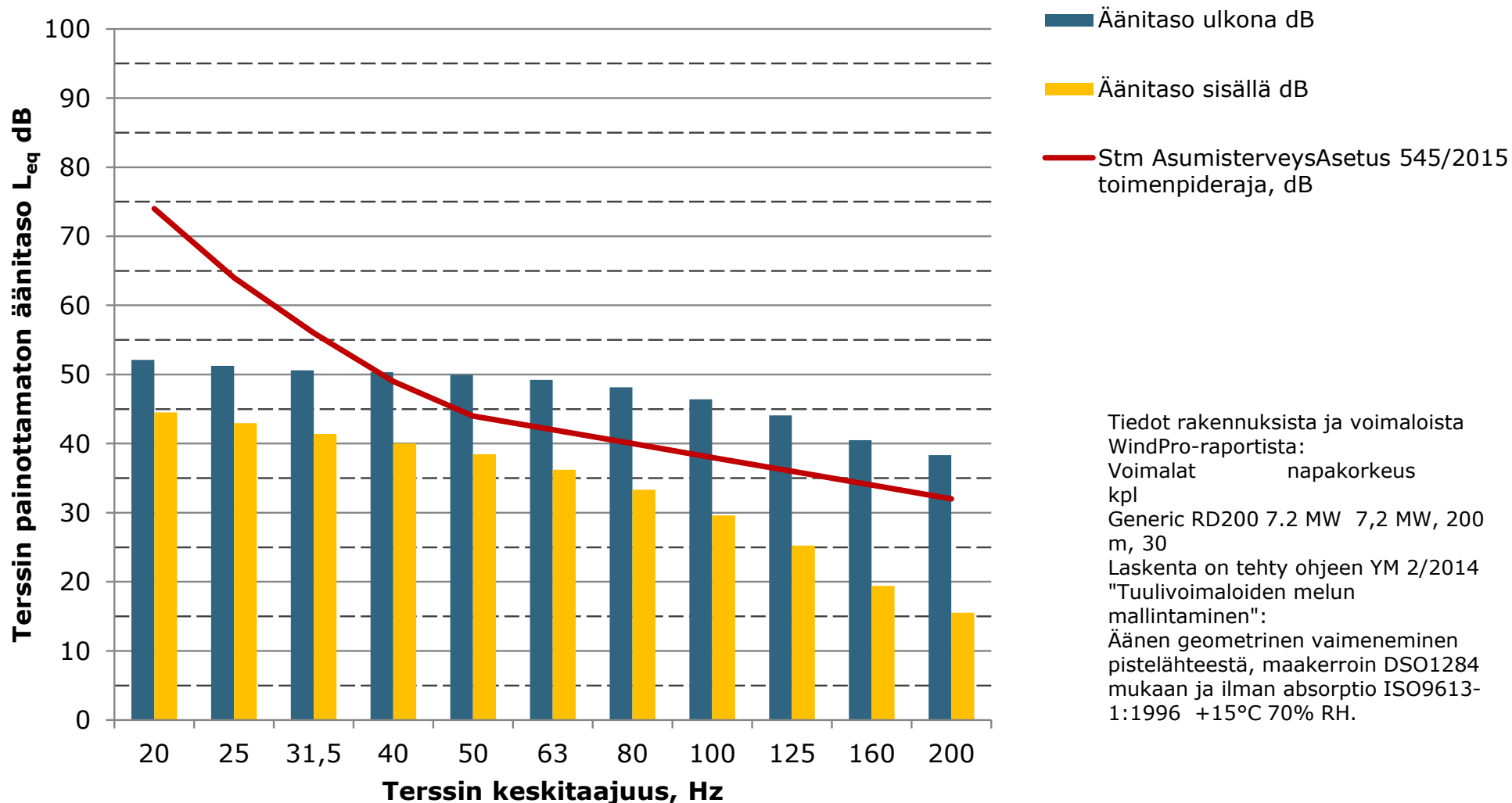




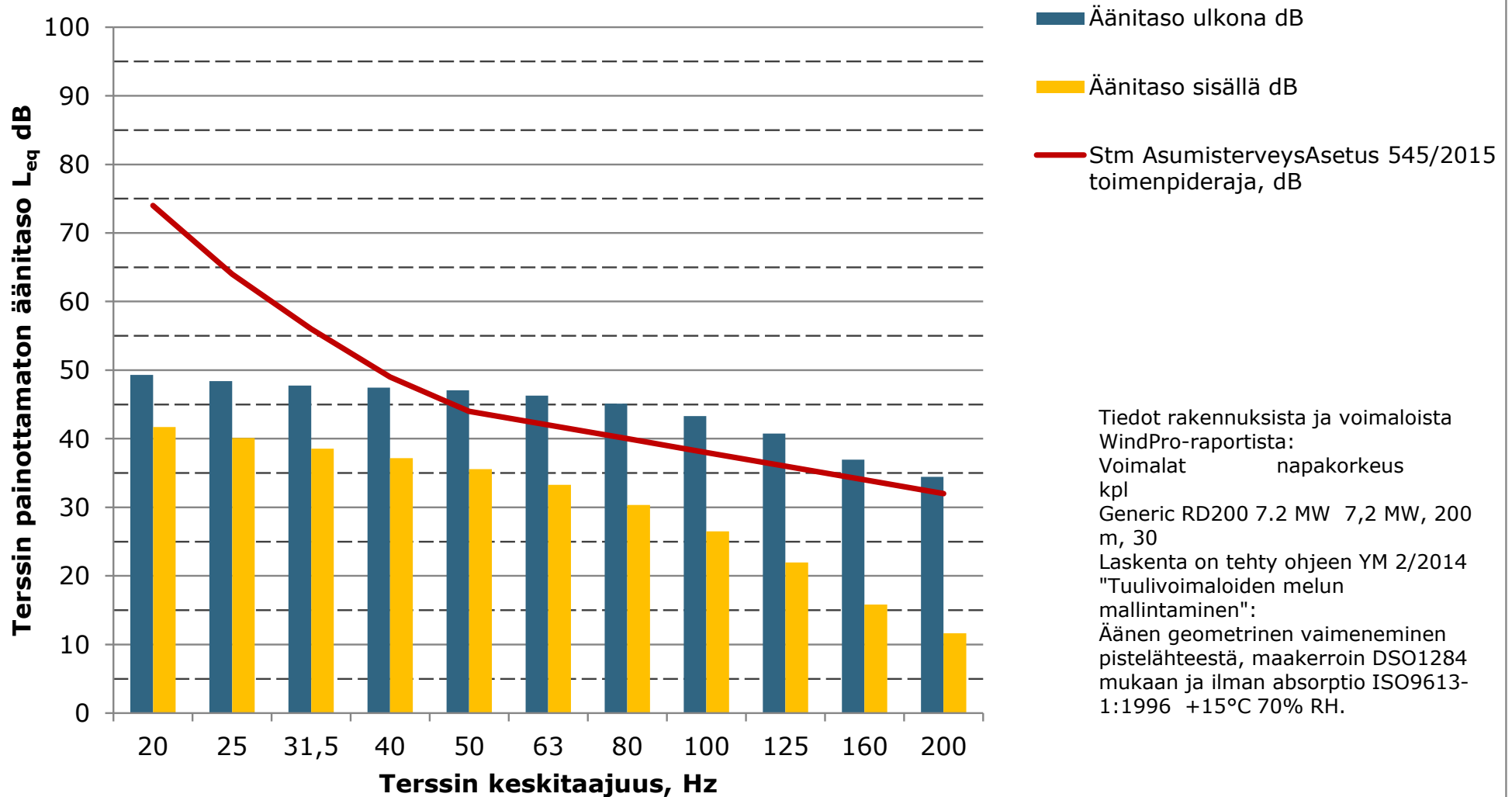
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus L (Tuohipuro), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



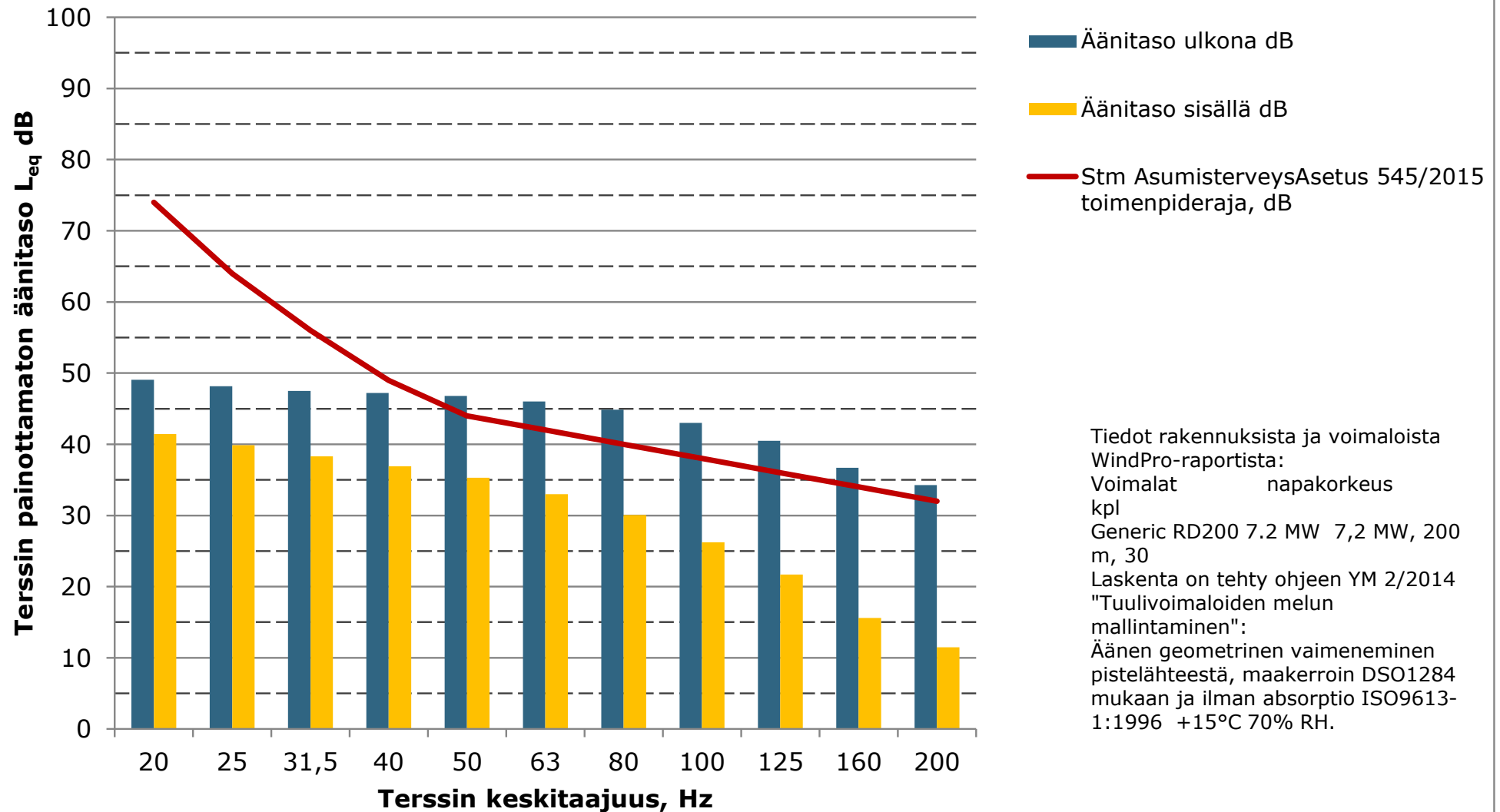
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus M
(Pilpanperä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**

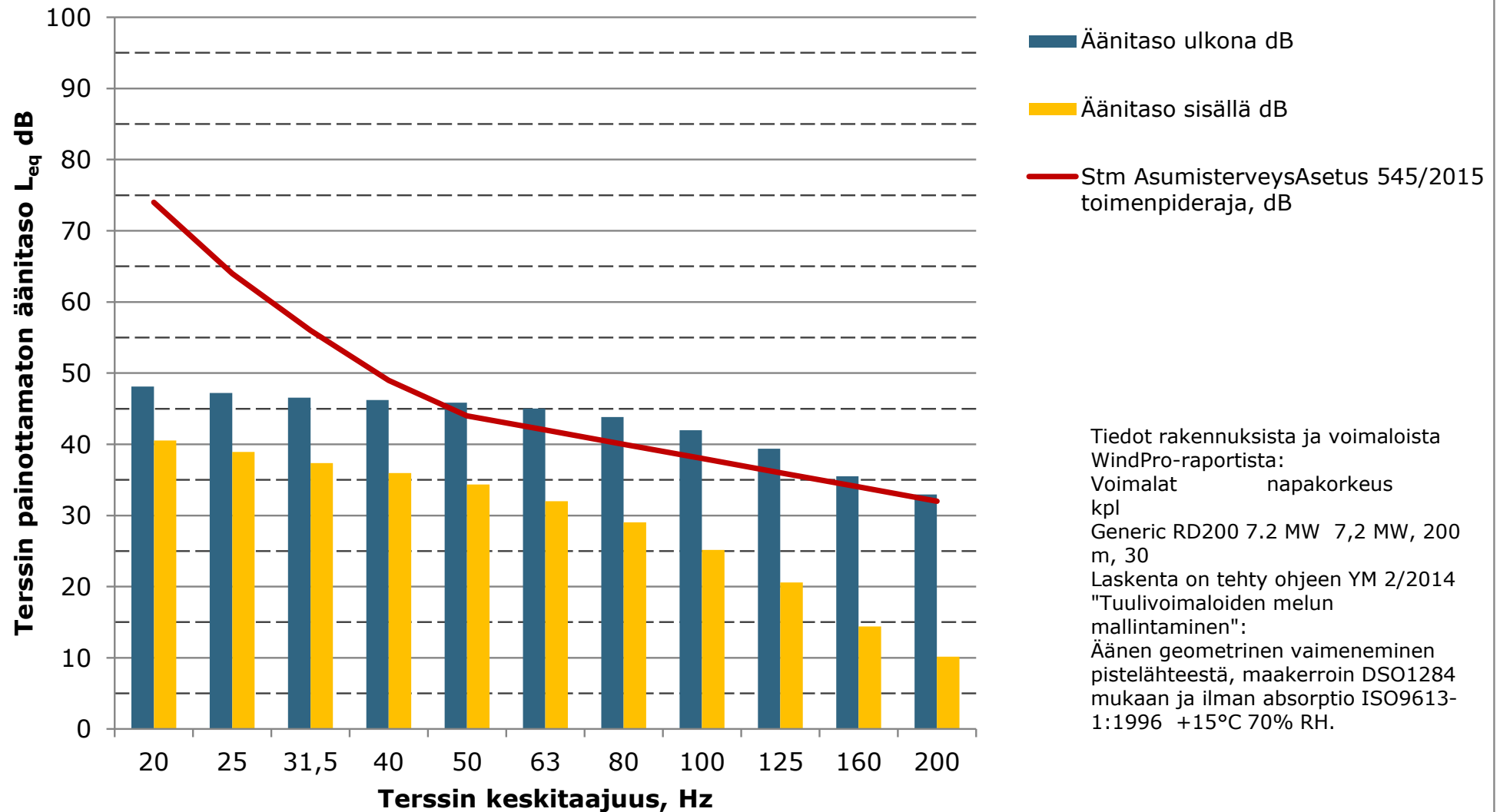


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus N
(Hanhikaarto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**

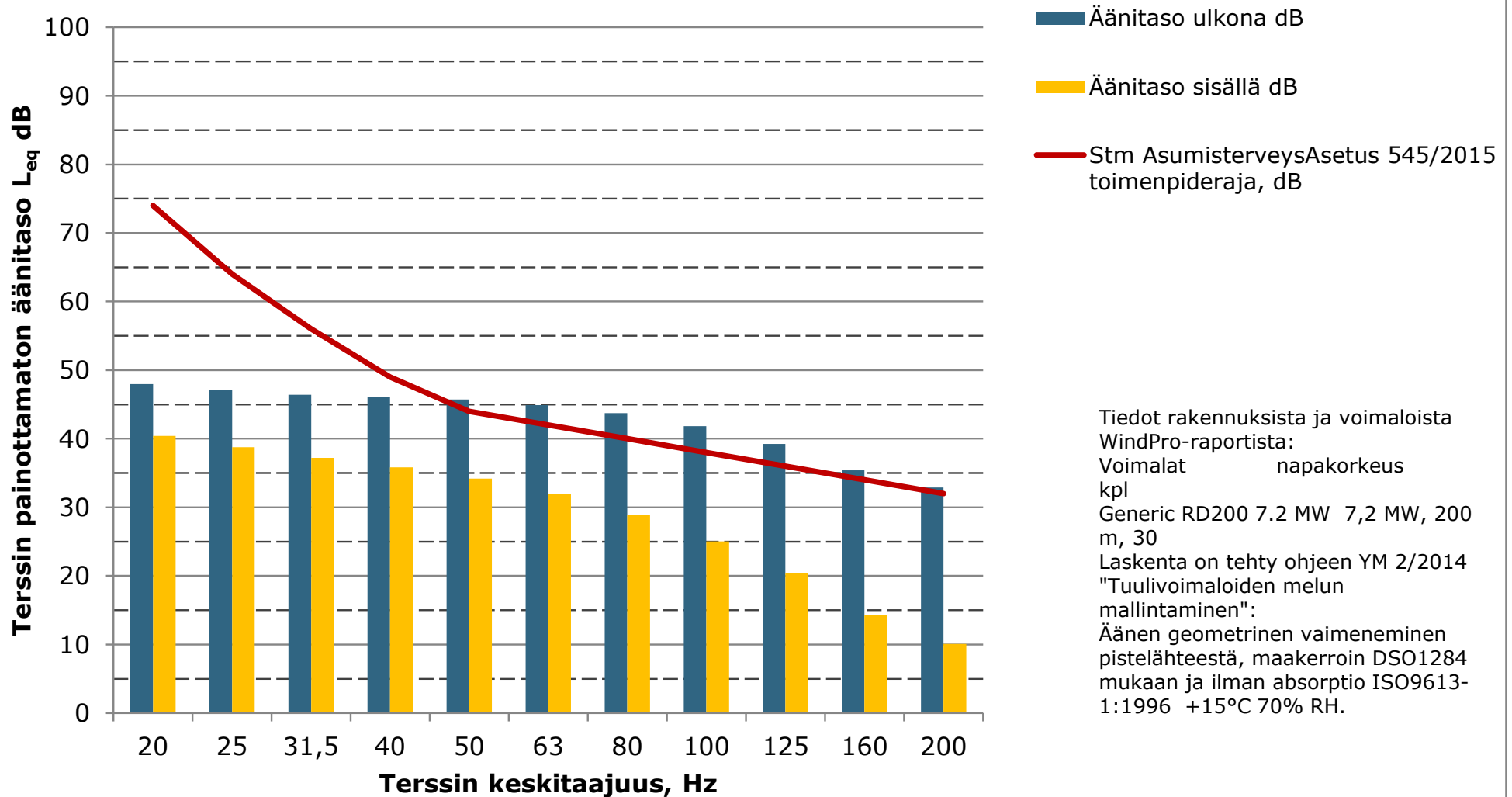


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus O (Ketola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

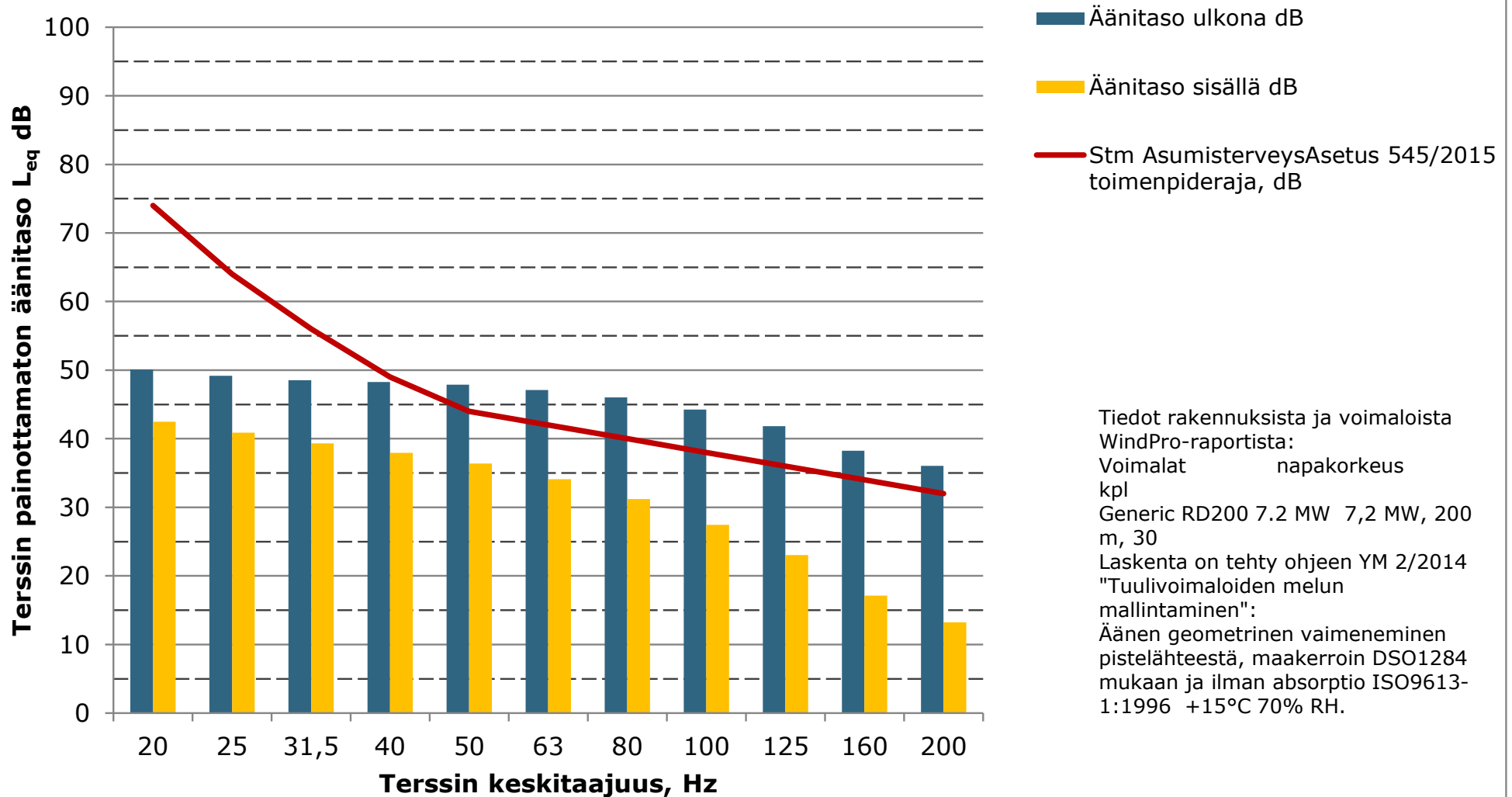


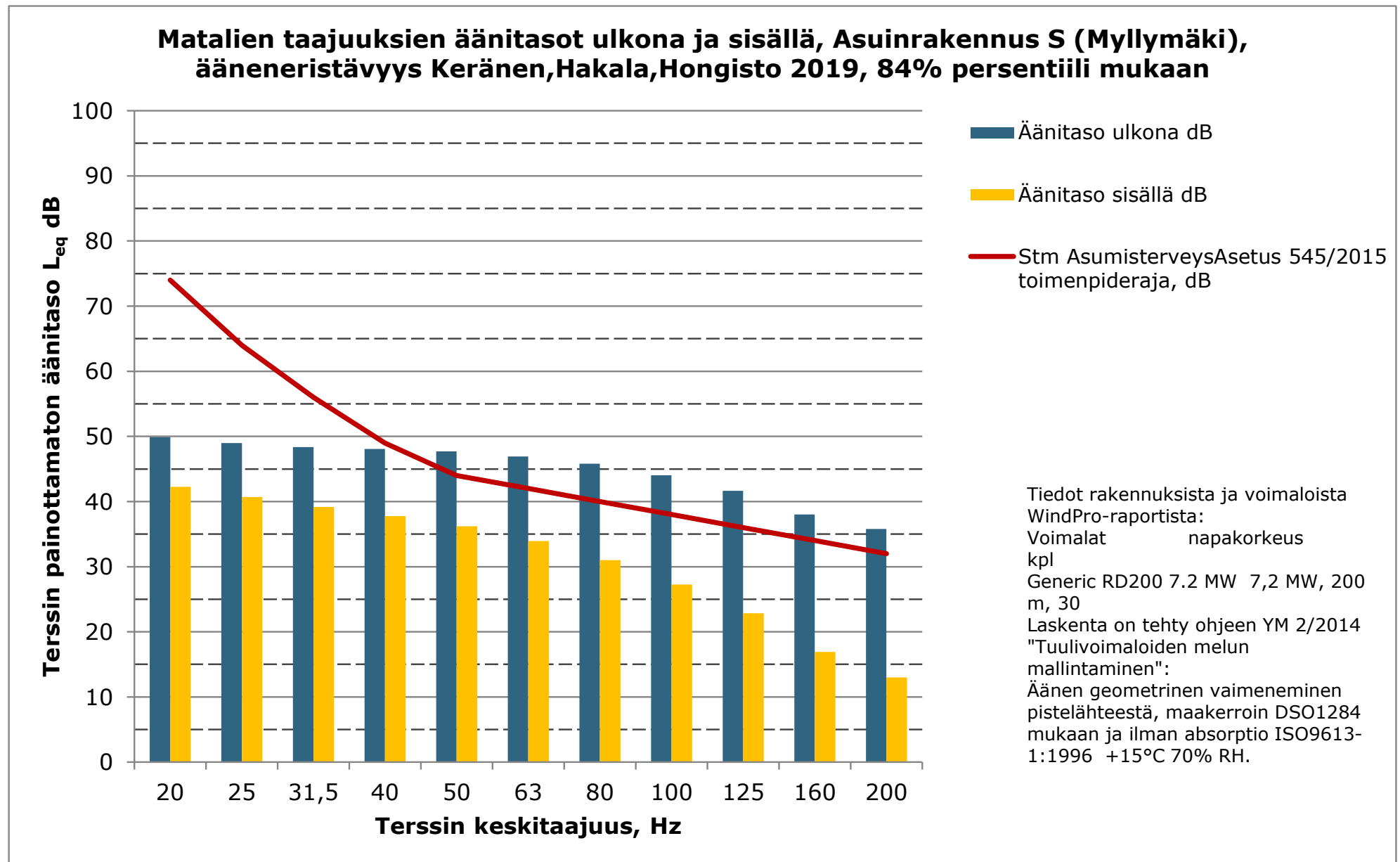
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus P (Kuistila),
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**

**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus Q
(Hautalehto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**

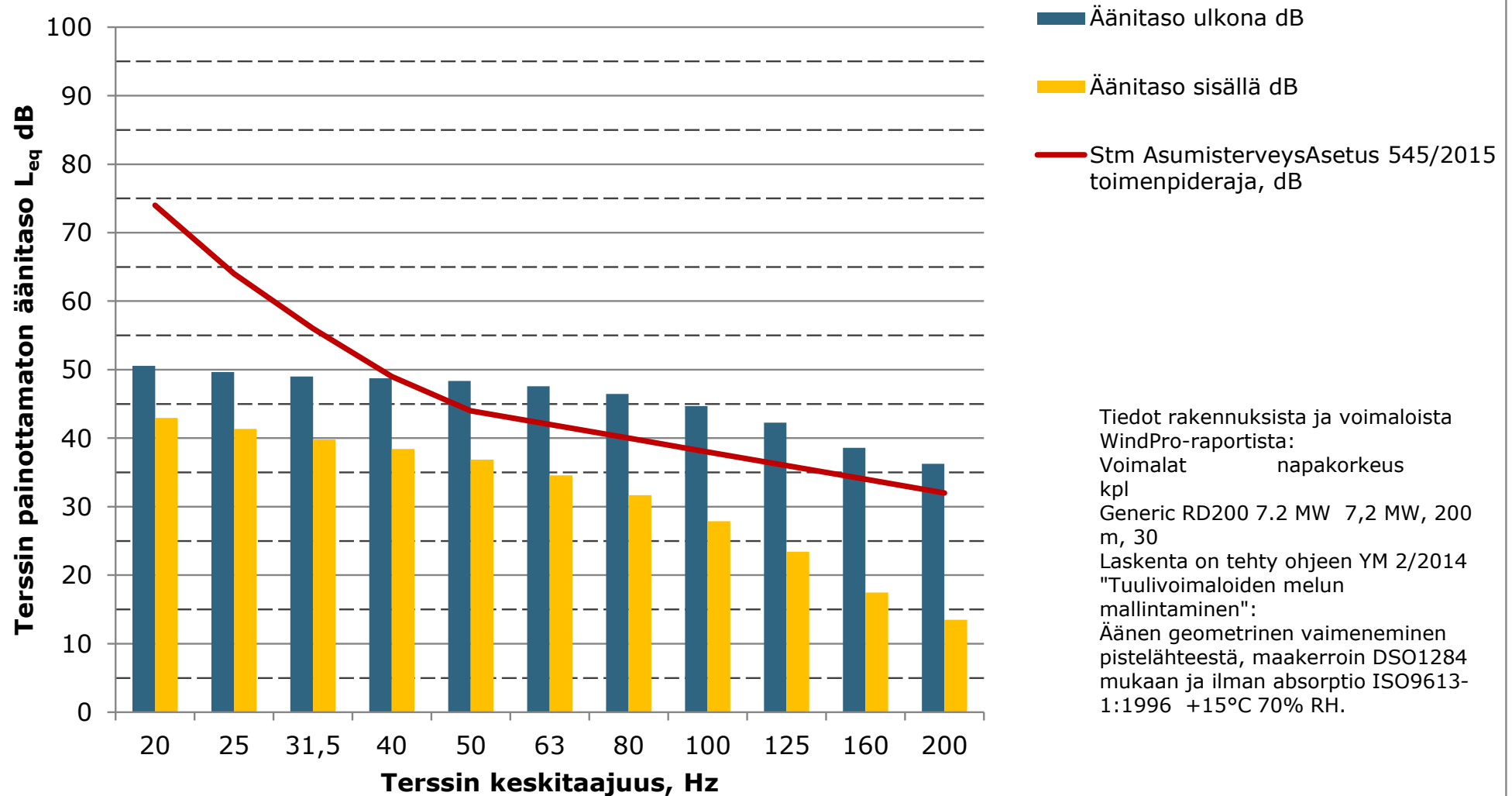


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus R
(Korpelanperä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



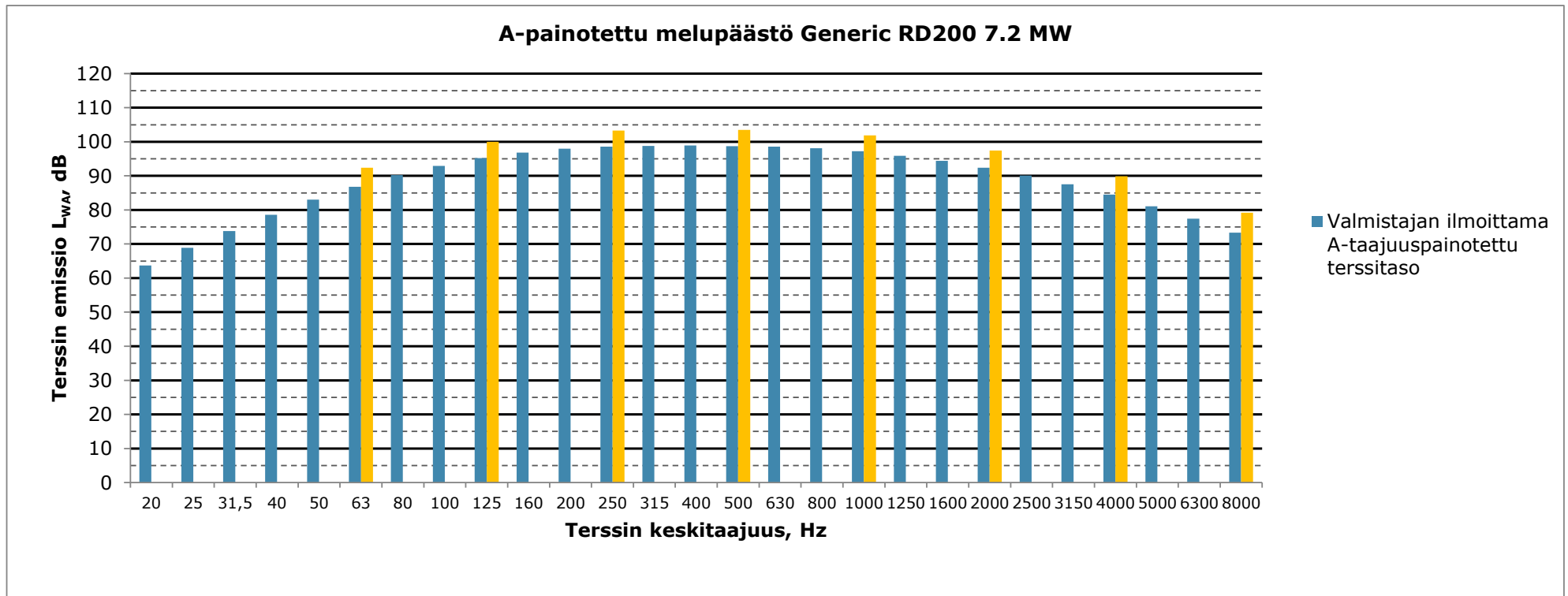


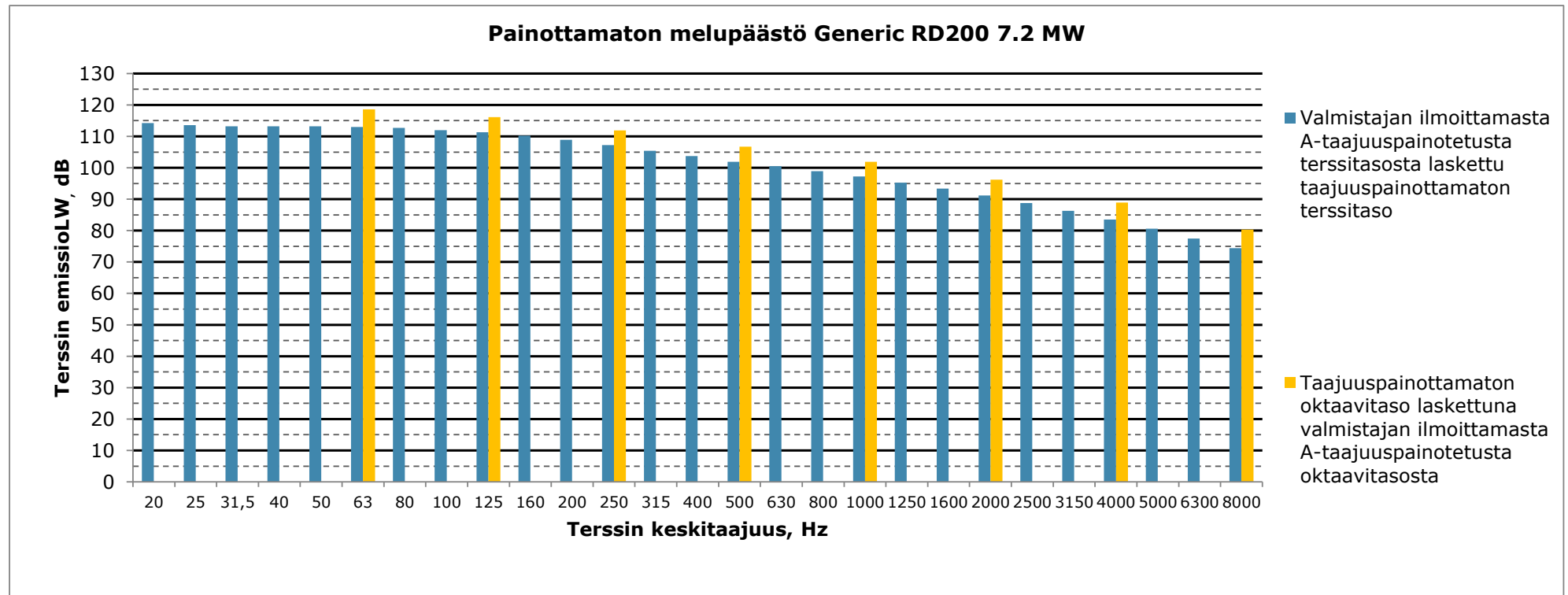
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus T
(Kärsämäenneva), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



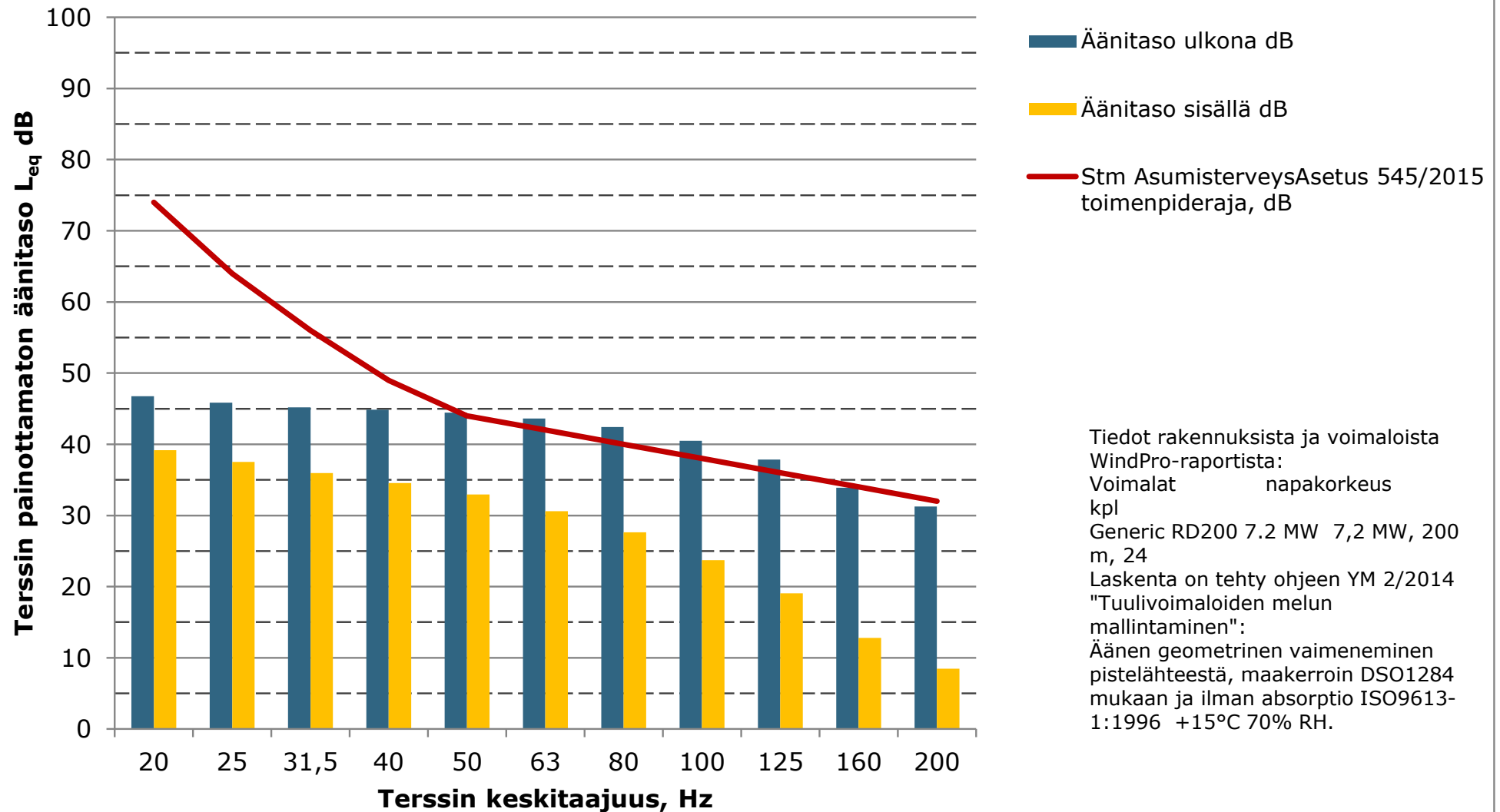
6.5.2024

**Liite 5. Pilpänkankaan tuulivoimahanke – matalataajuisen melun rakennuskohtaiset arvot VE2
Generic RD200–7.2 MW.**

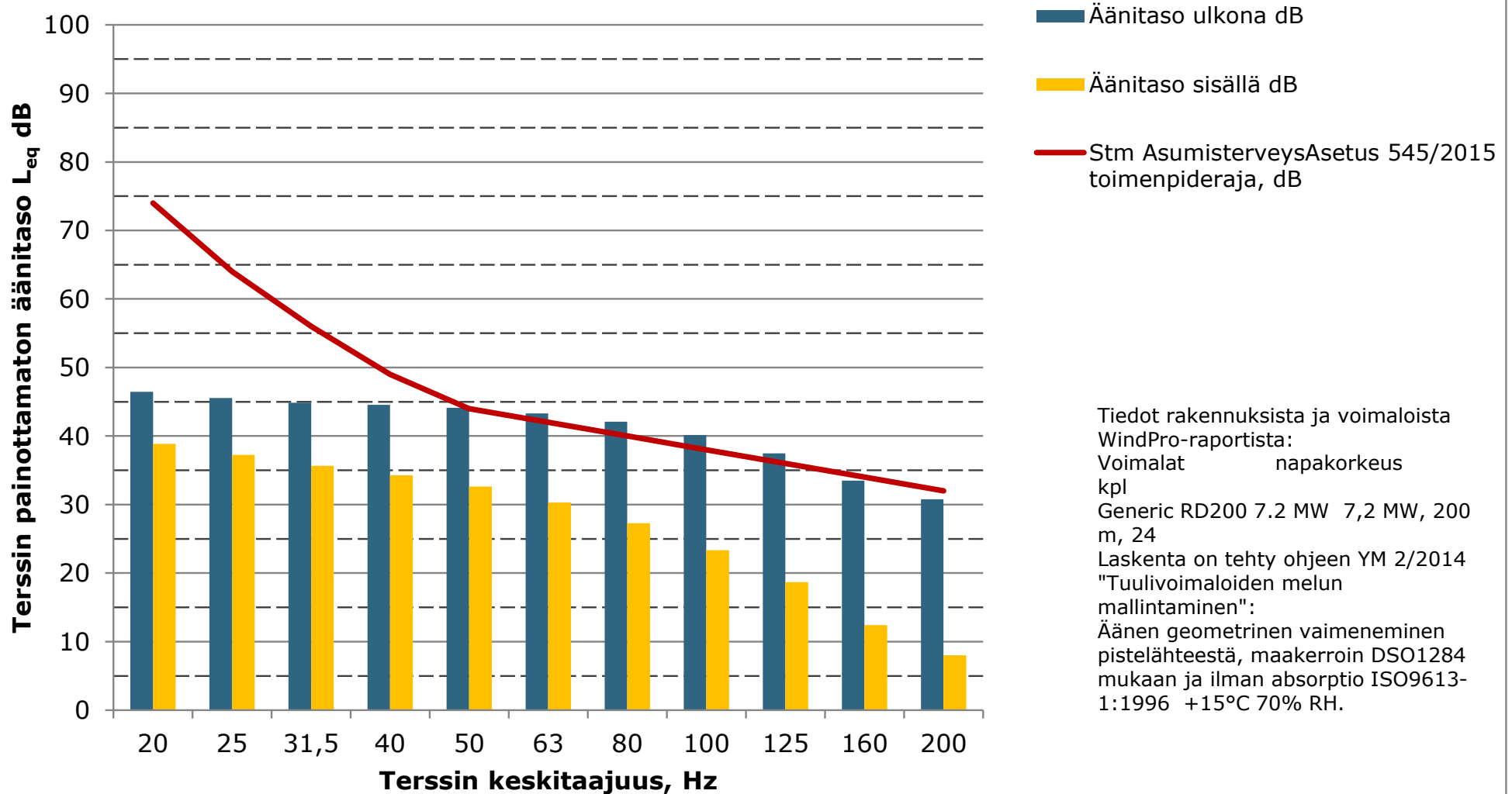


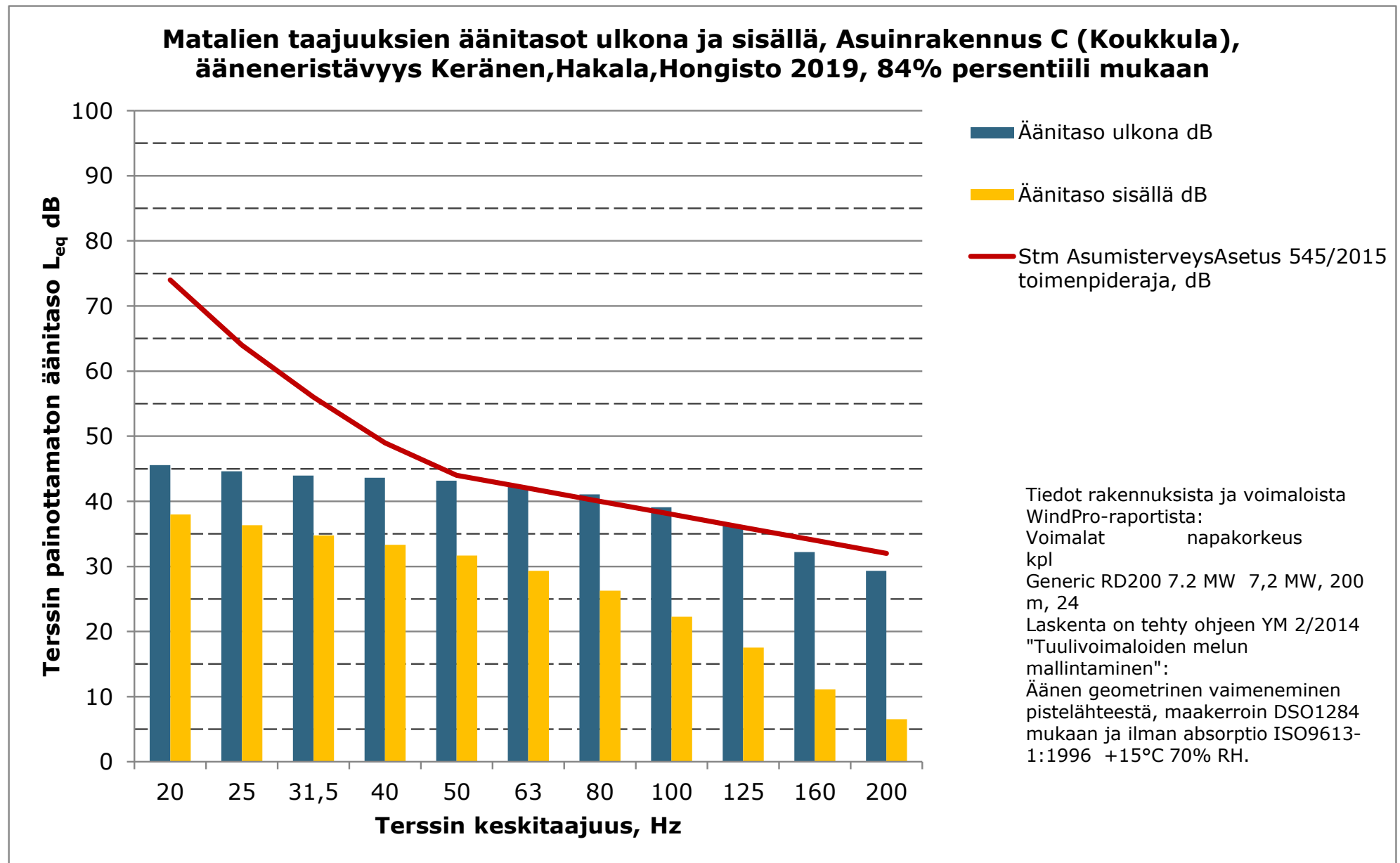


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus A (Nurmiaho), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

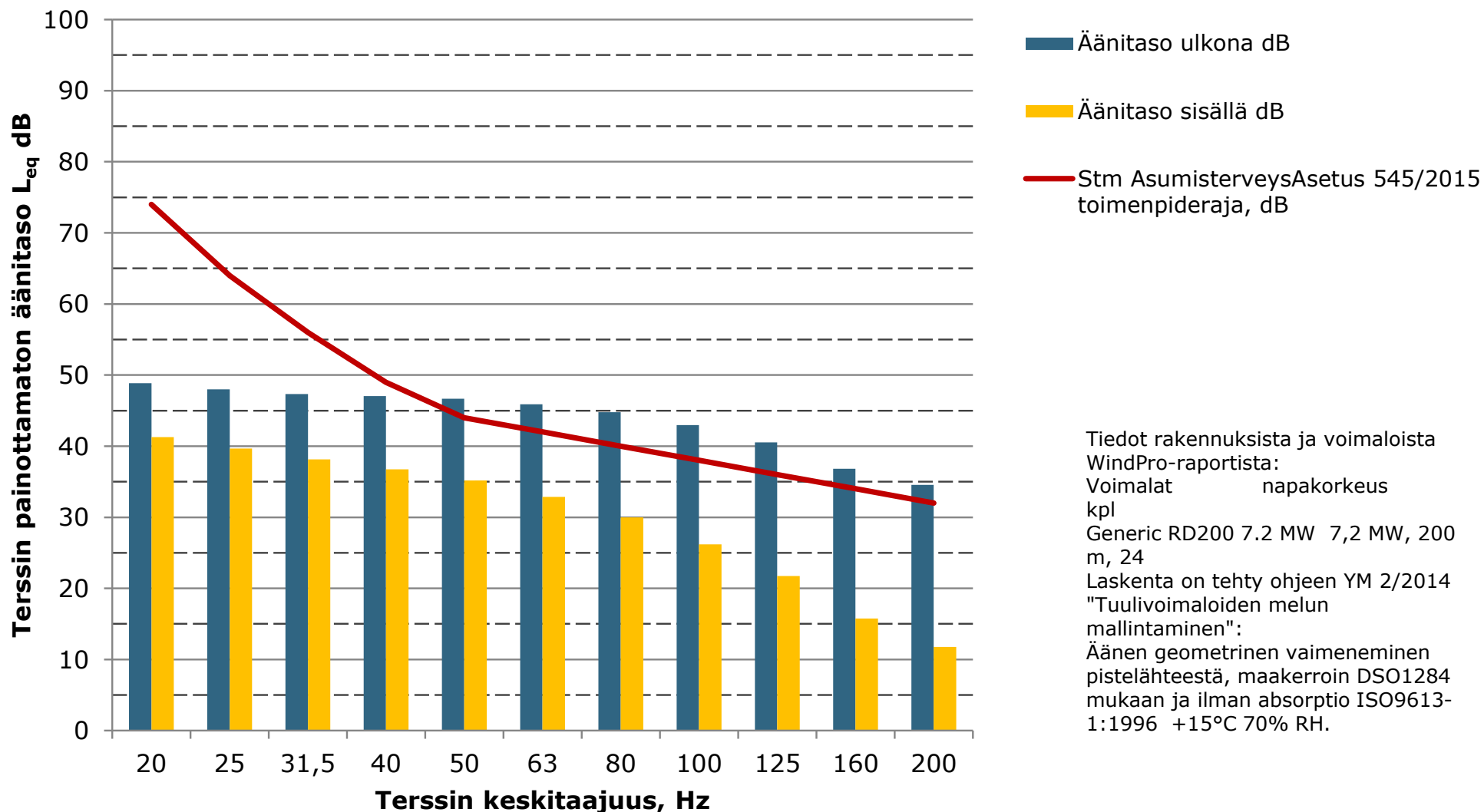


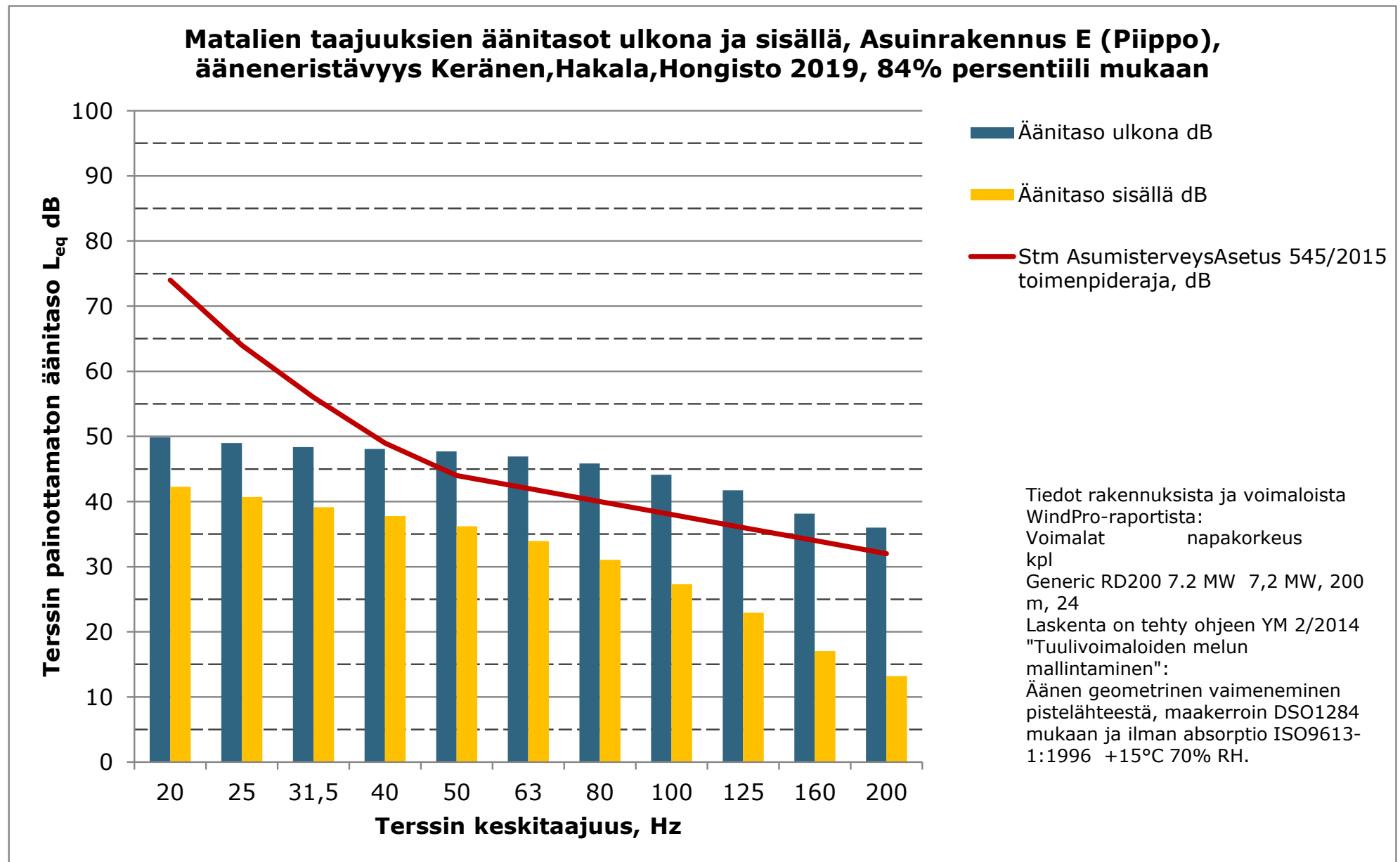
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus B
(Kivikangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**



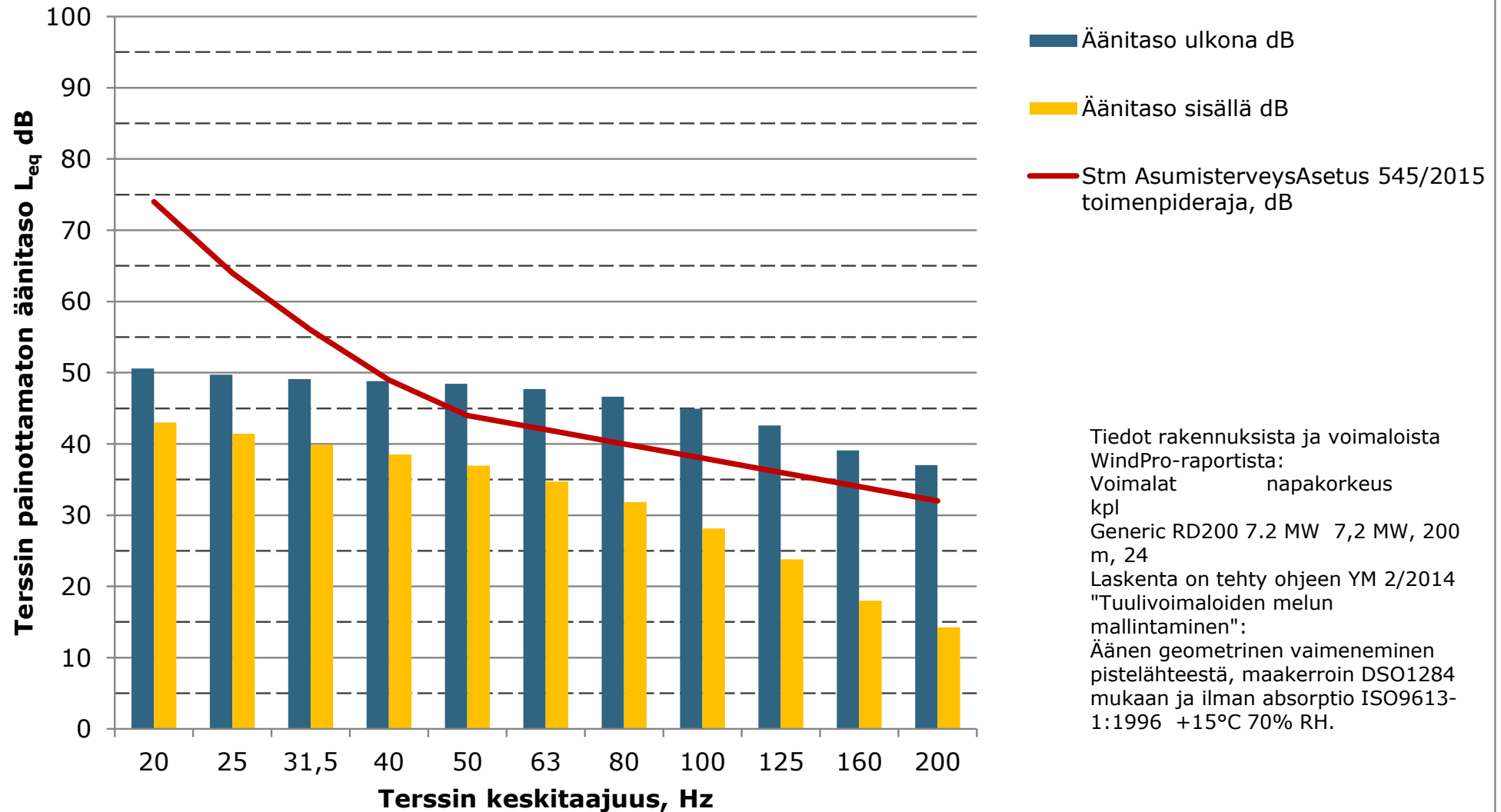


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus D (Konola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

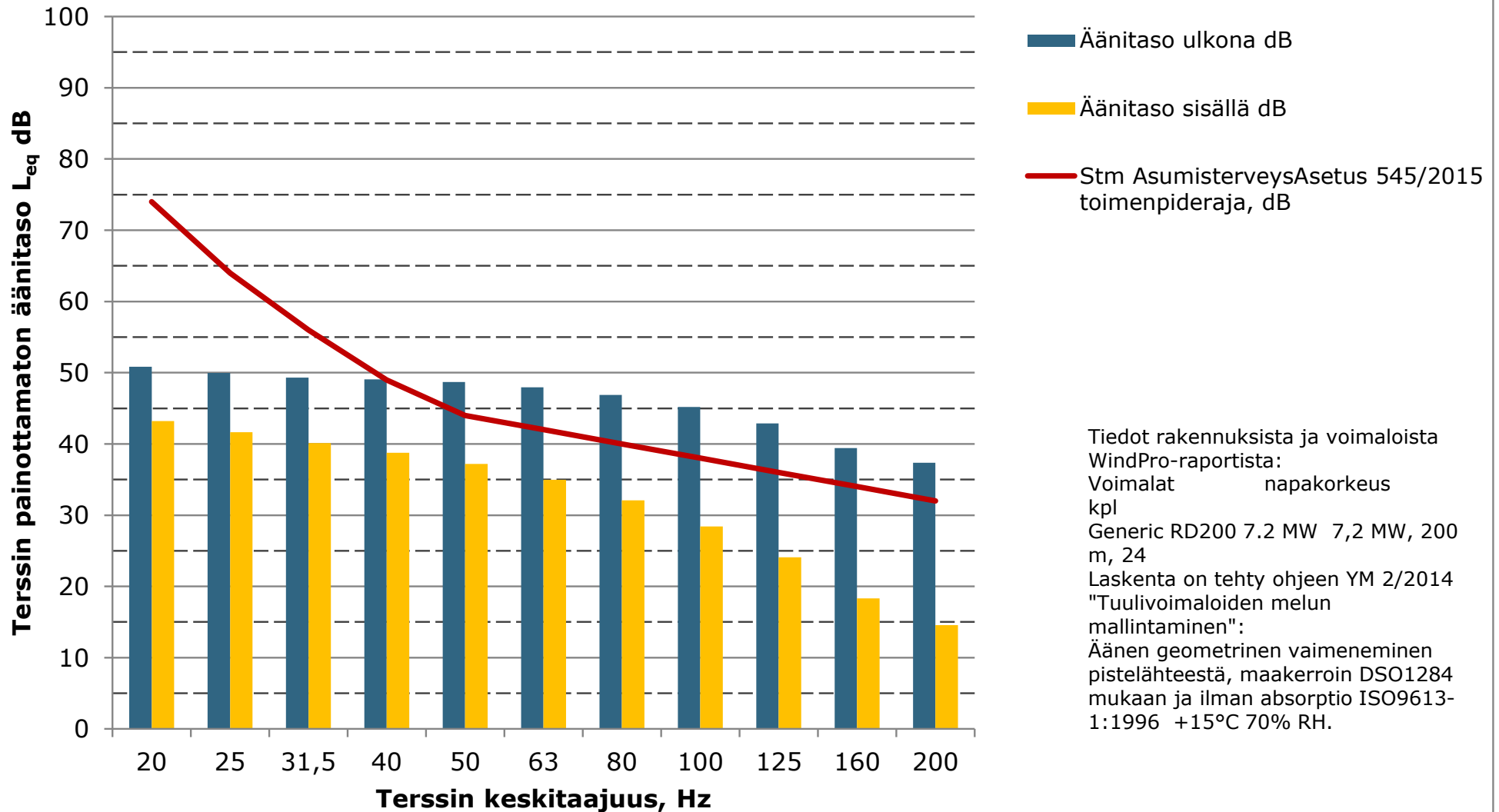


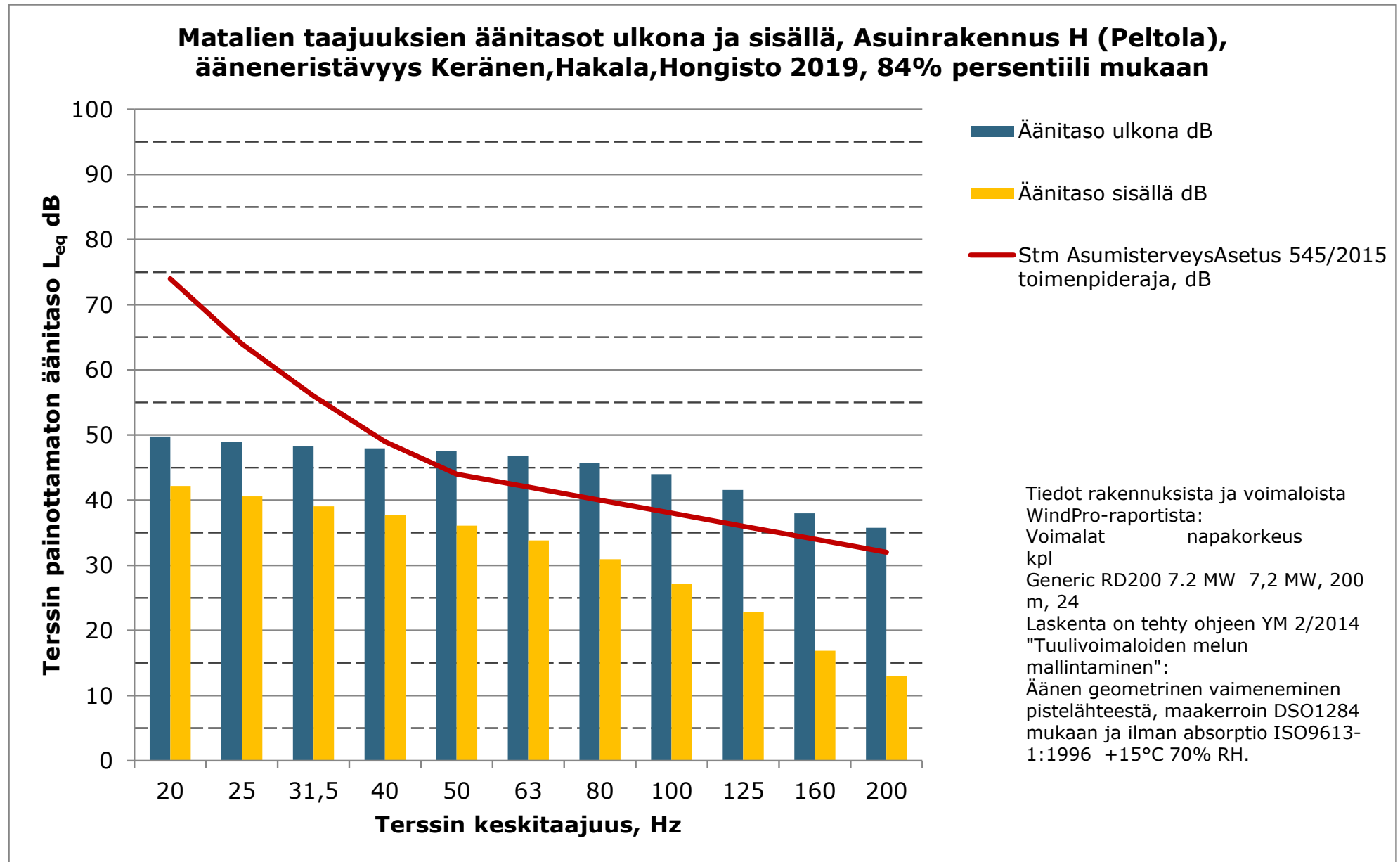


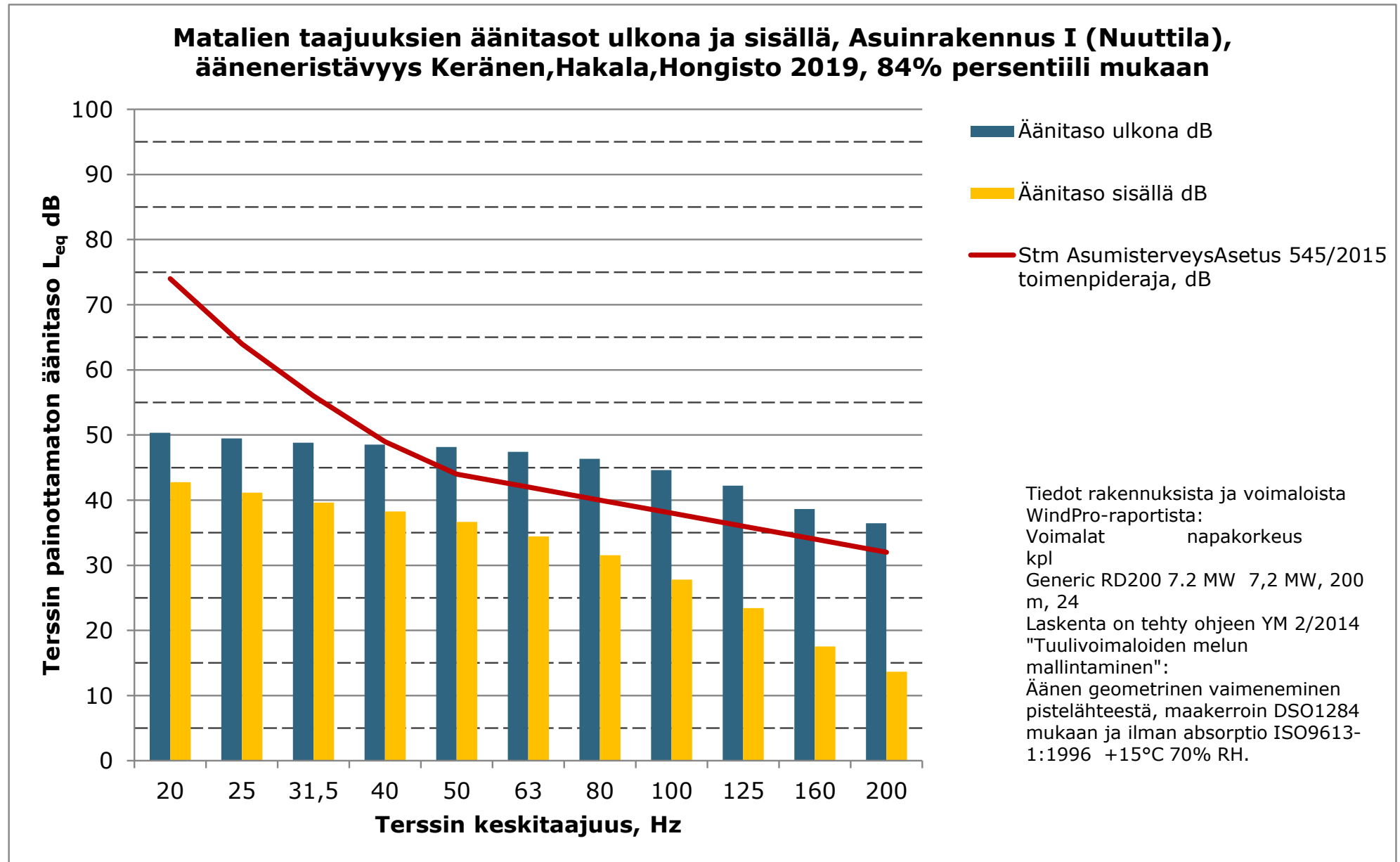
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Pääkkö), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



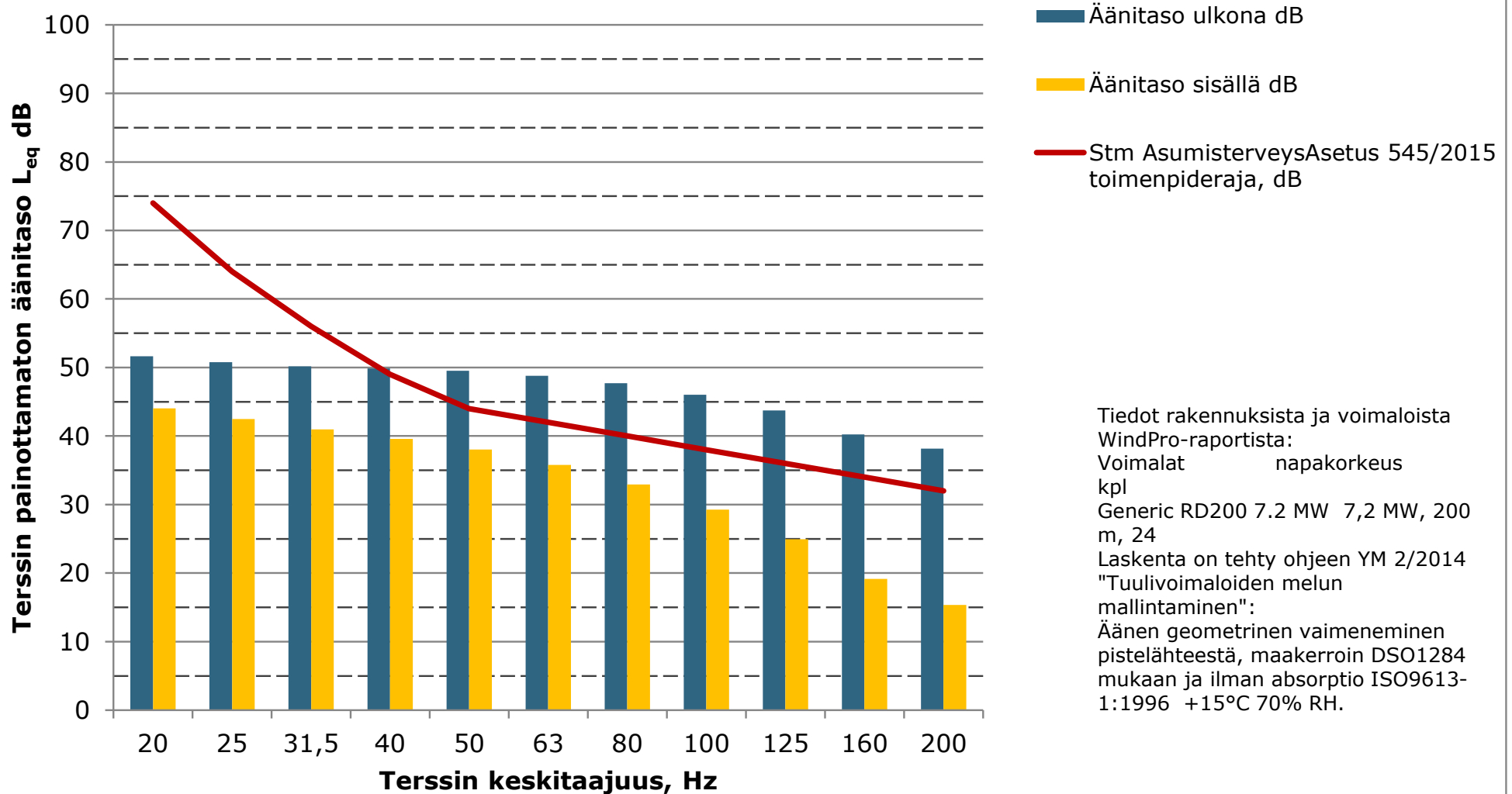
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus G (Pääkkölä),
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



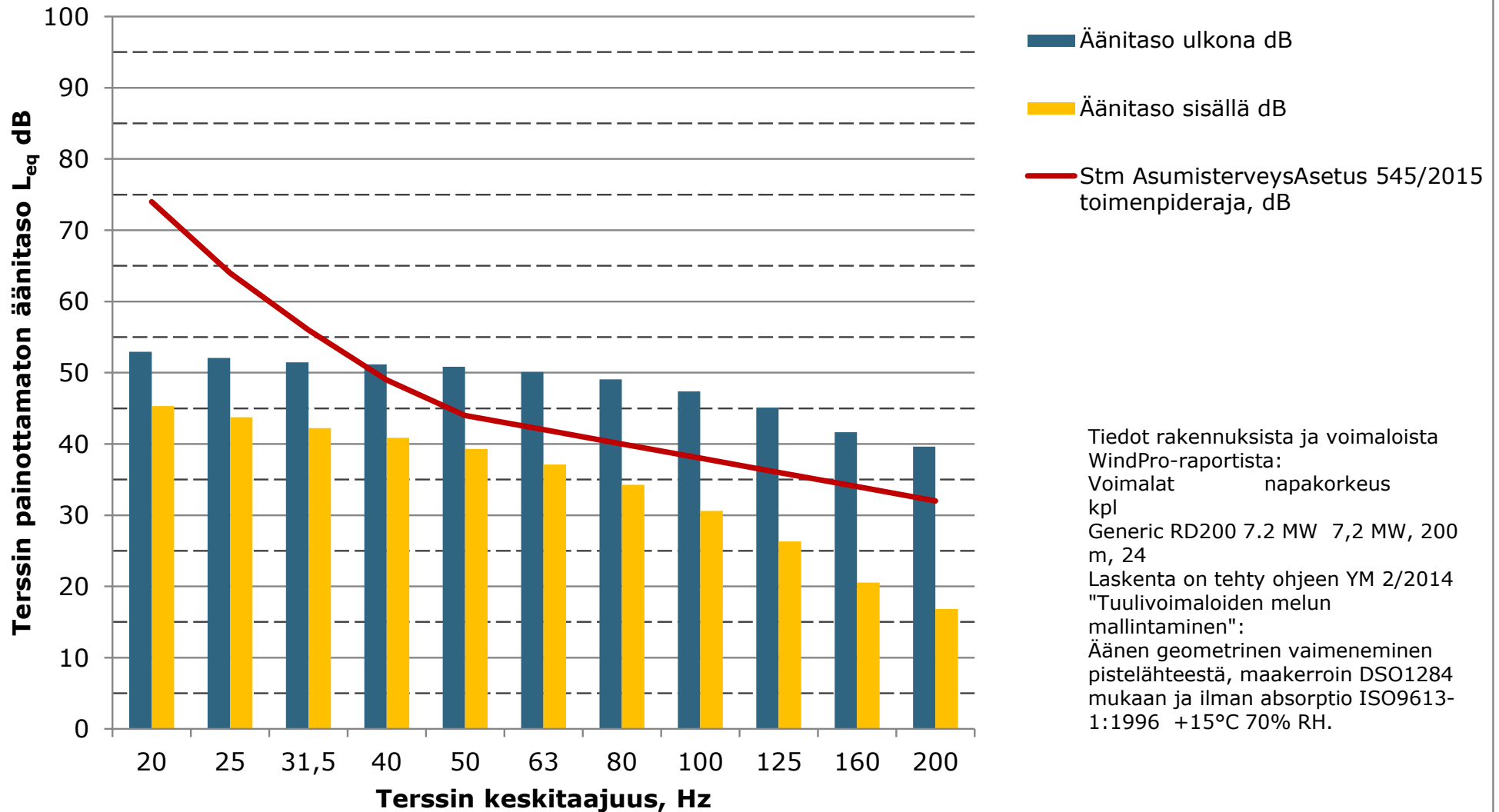


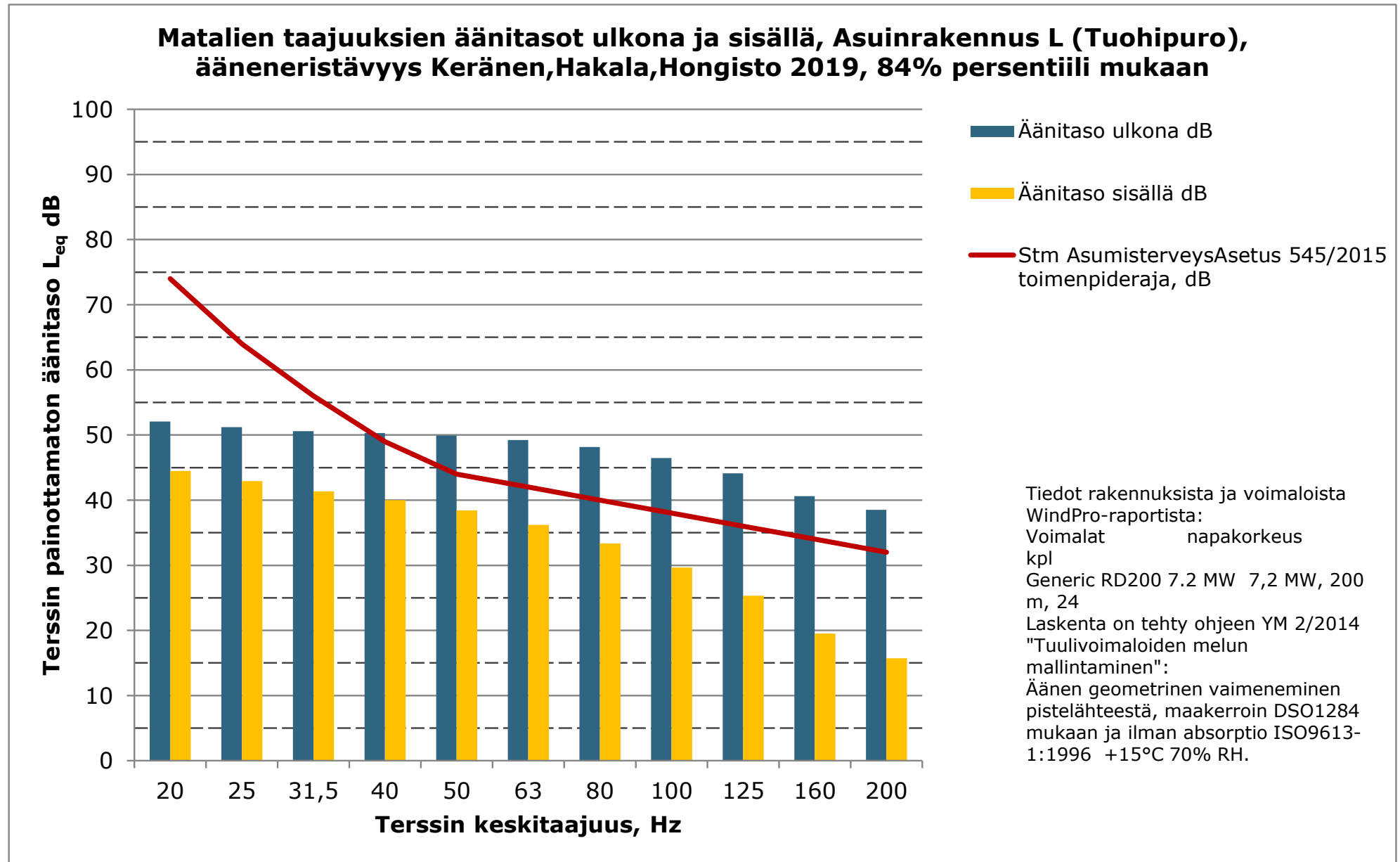


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus J
(Ahmokangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**

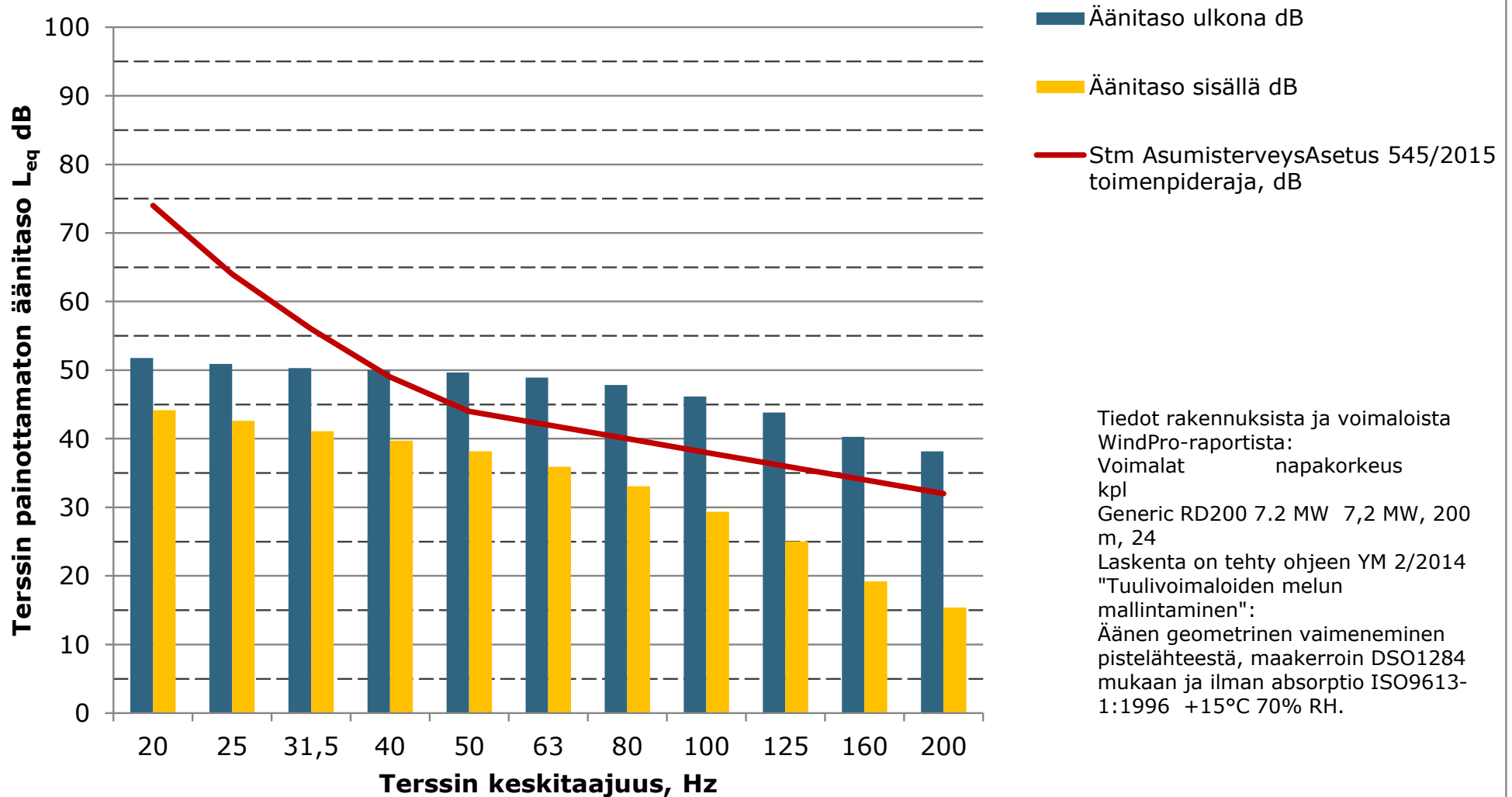


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Ketola),
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**

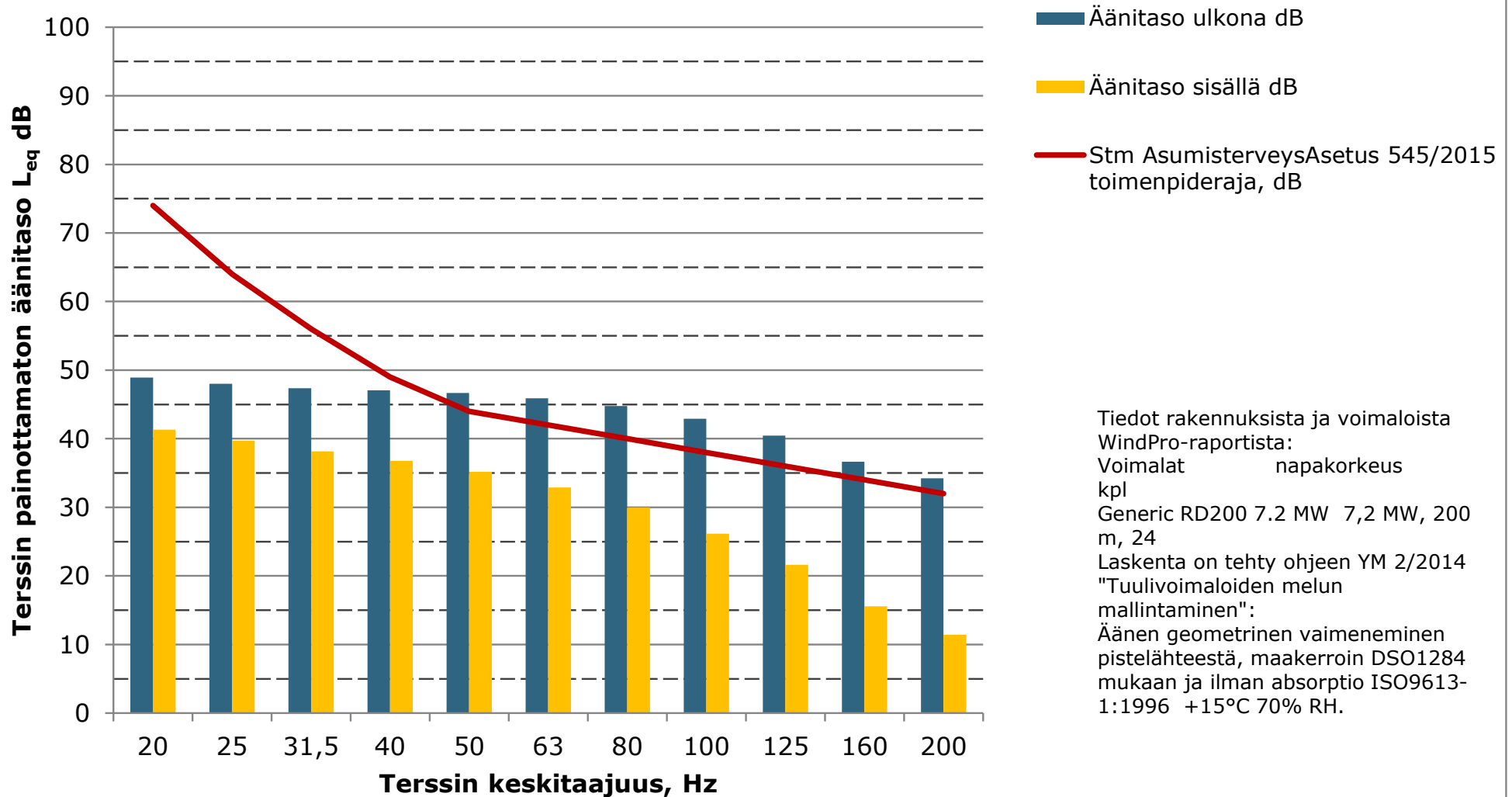


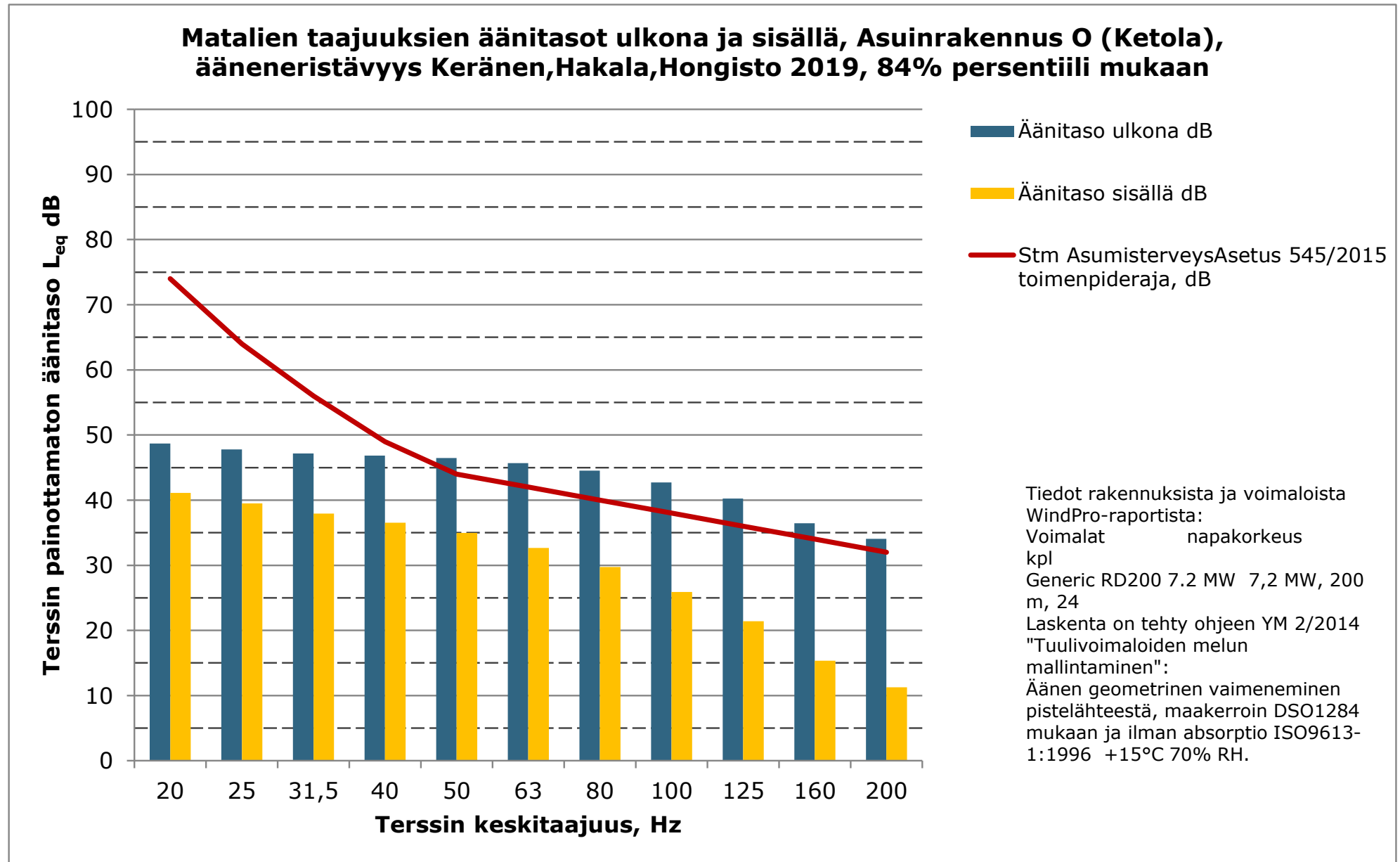


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus M
(Pilpanperä), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili
mukaan**

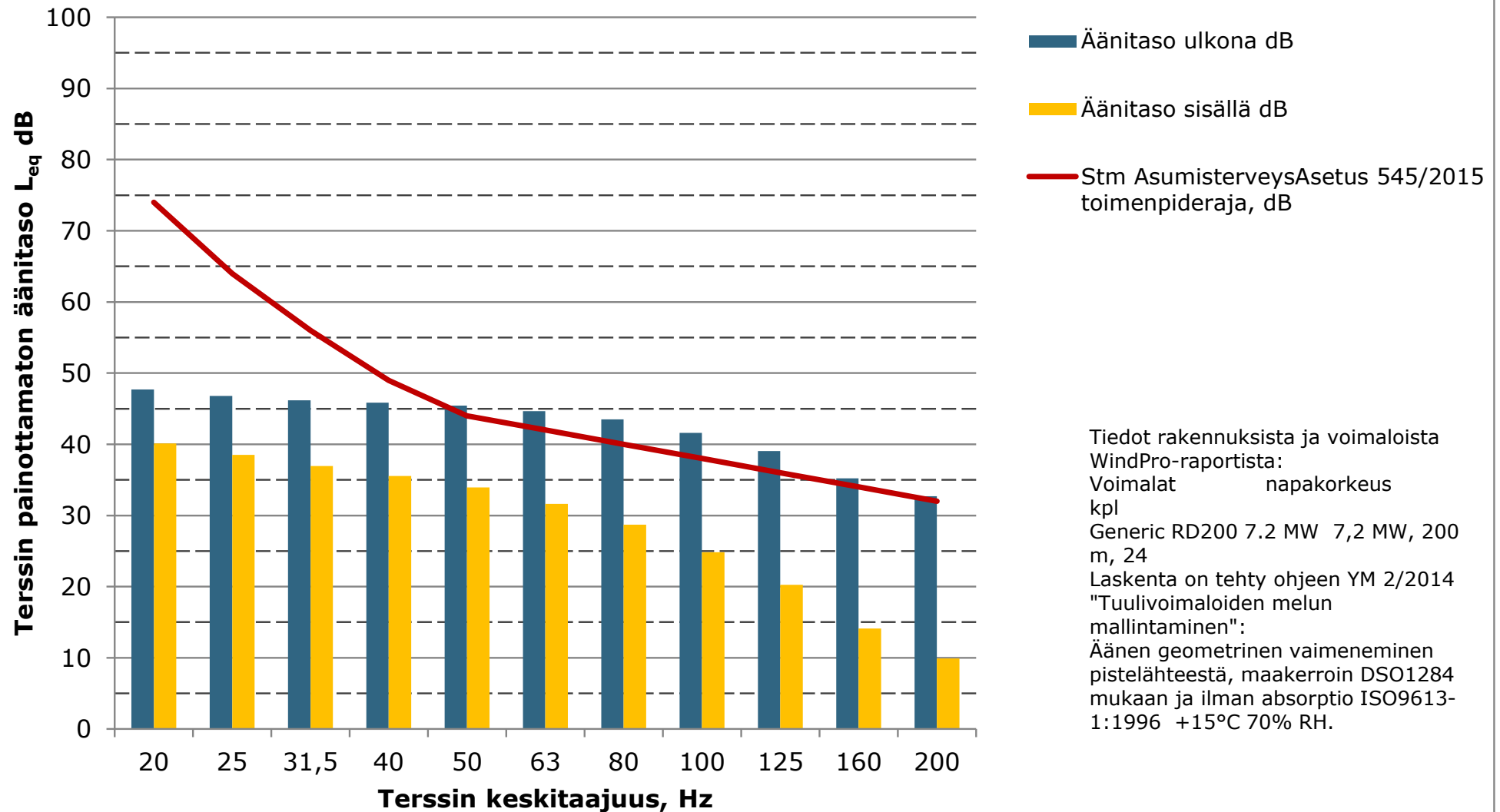


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus N
(Hanhikaarto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**

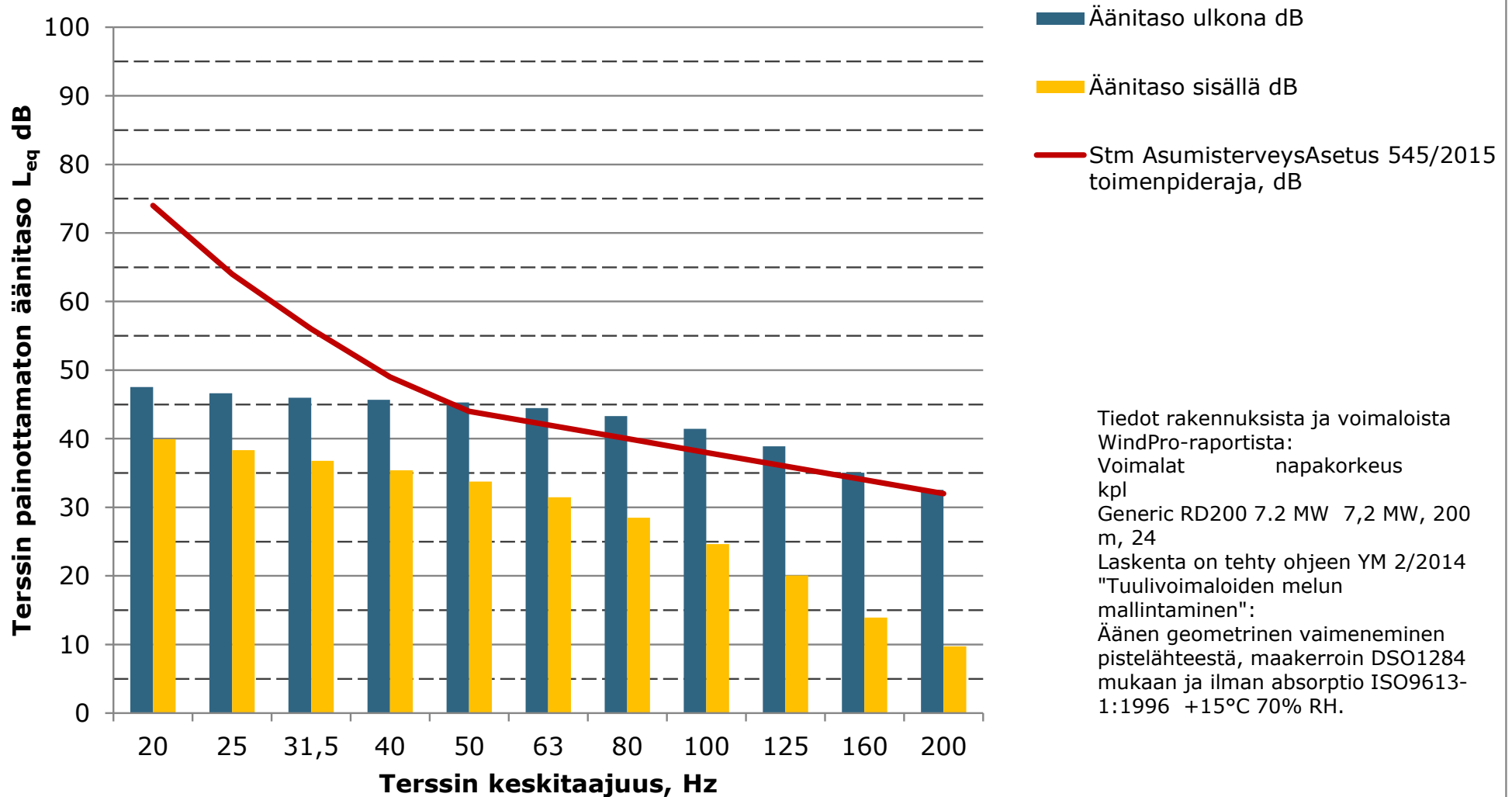




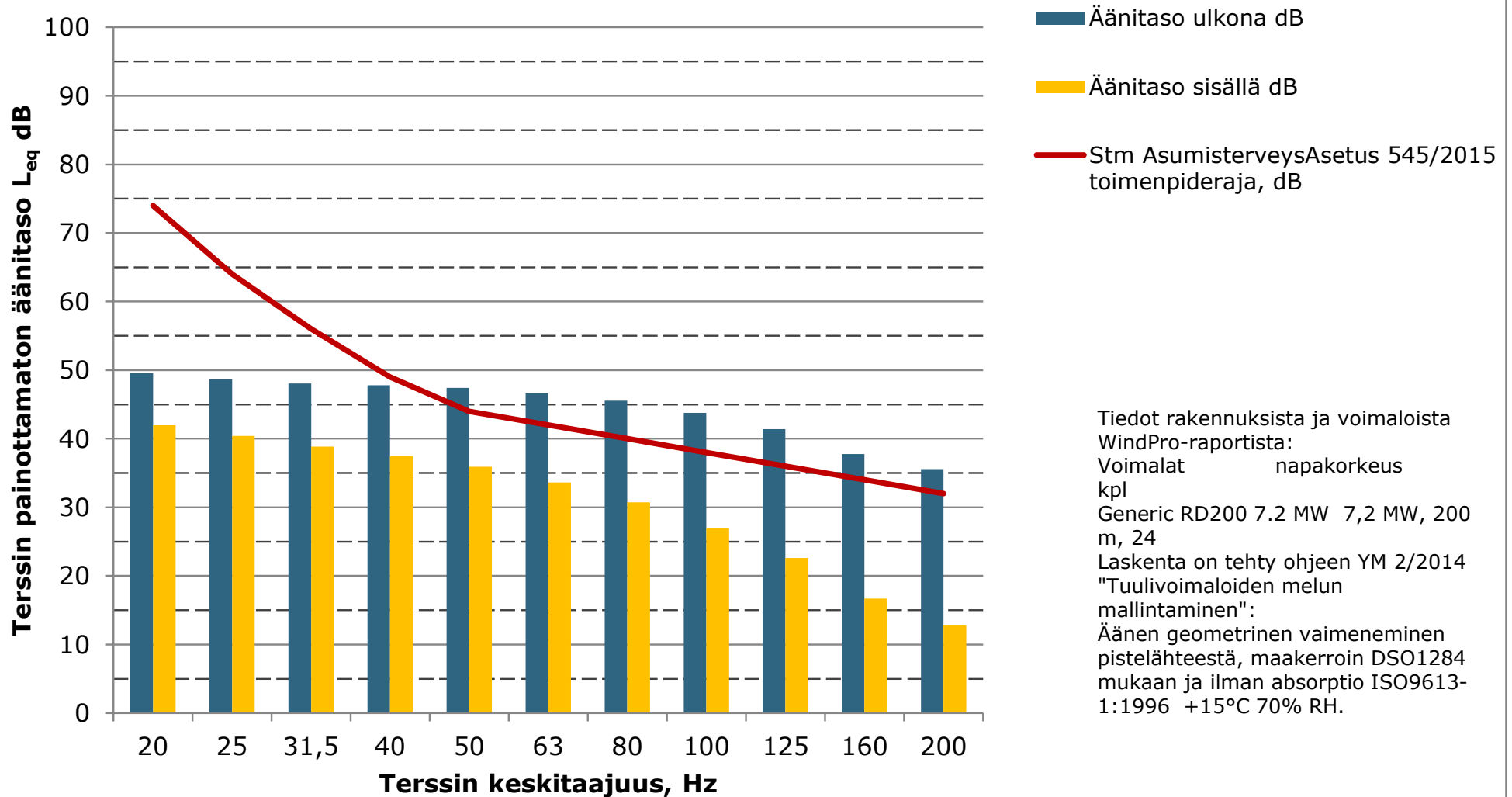
Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakenus P (Kuistila), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

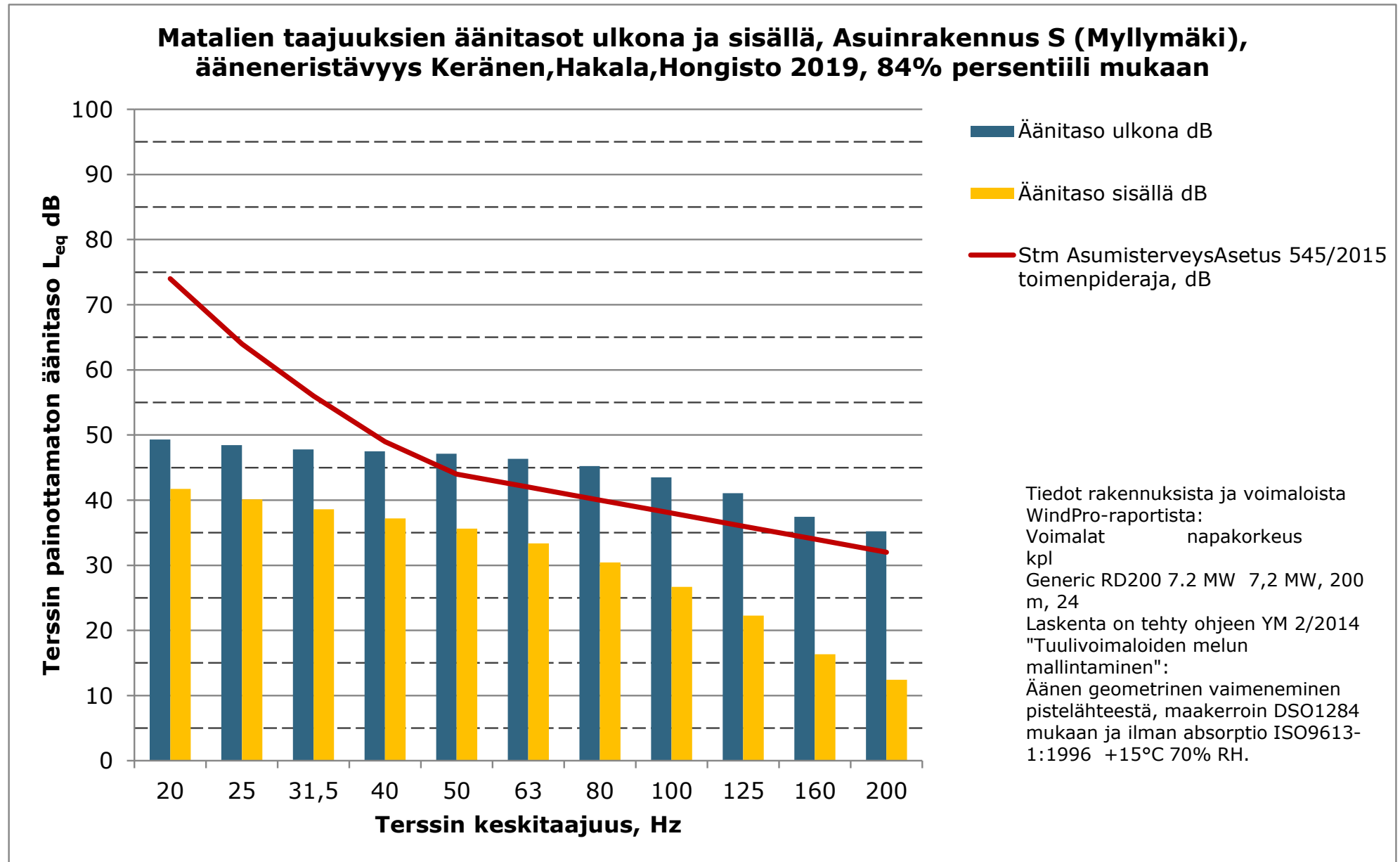


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus Q
(Hautalehto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**

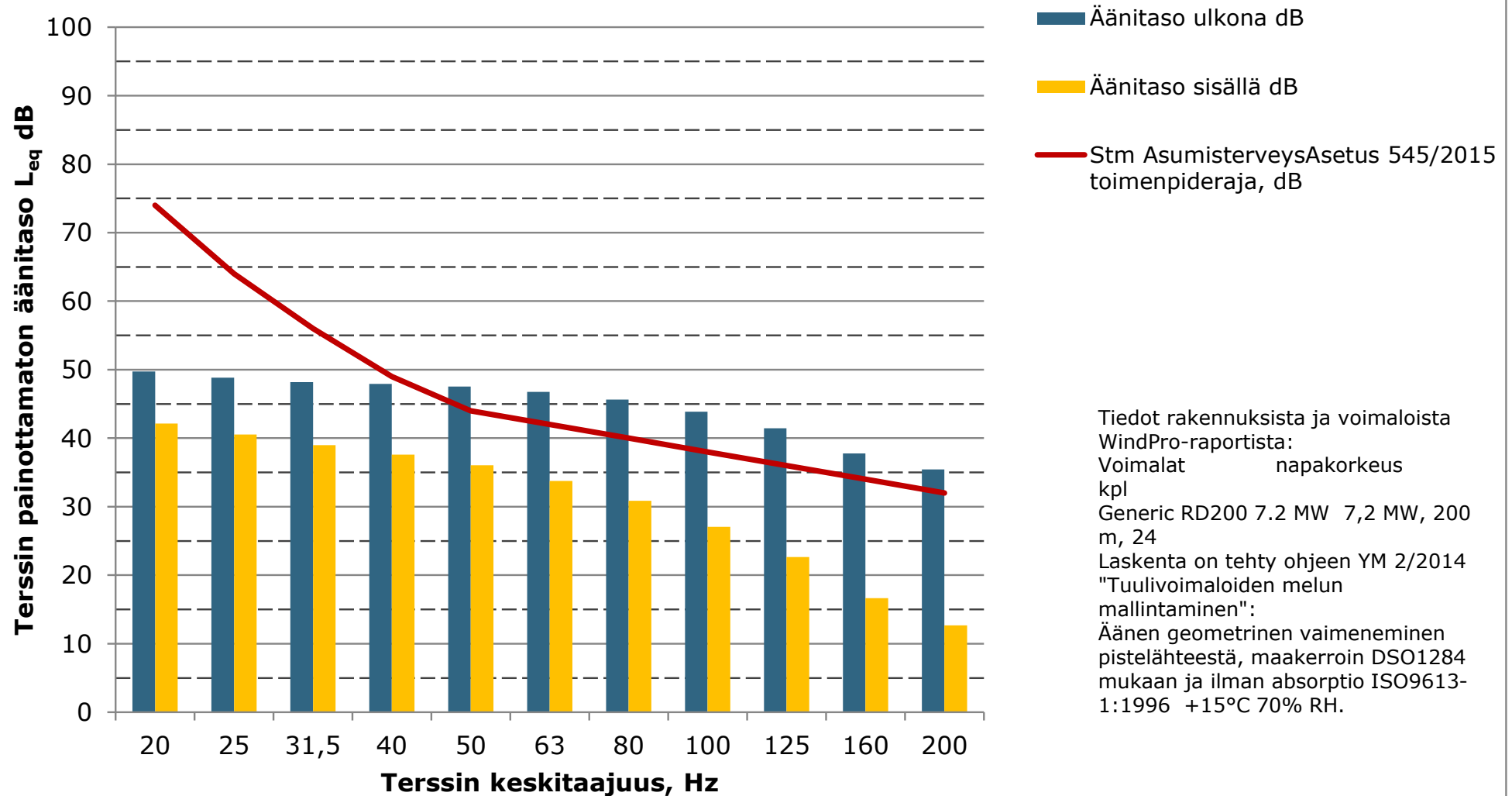


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus R
(Korpelanperä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



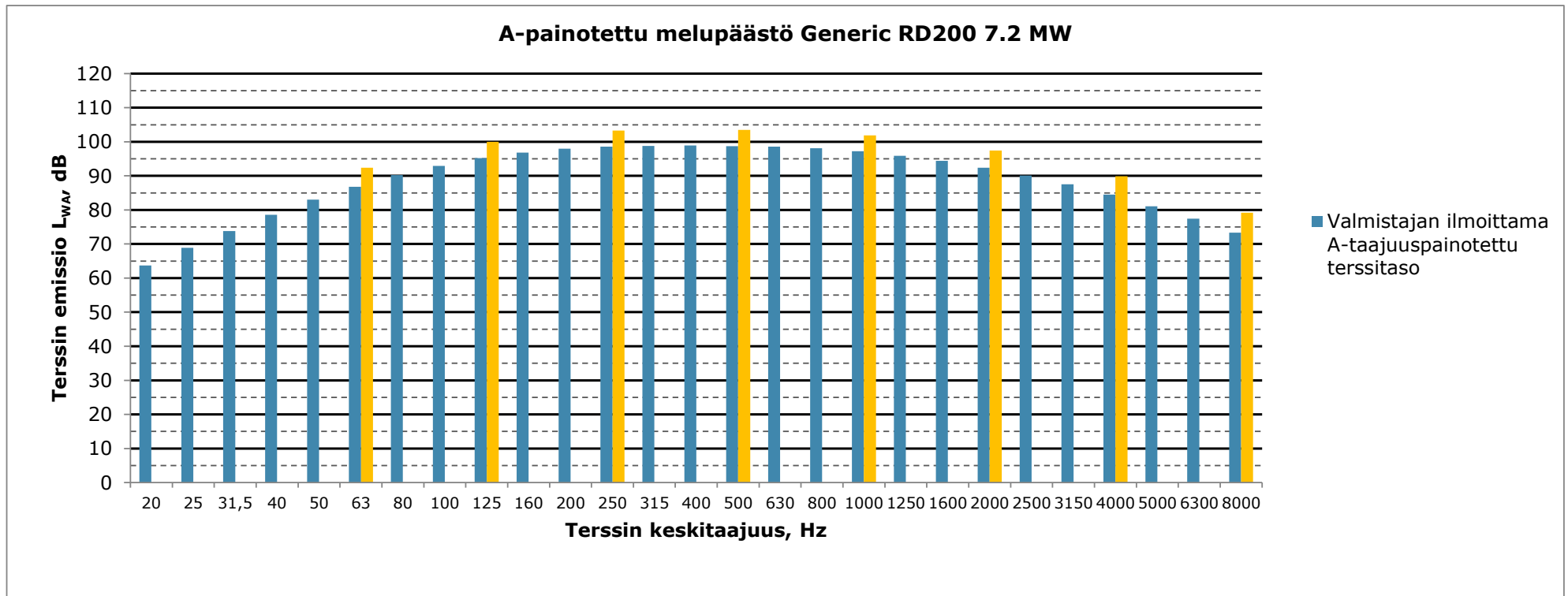


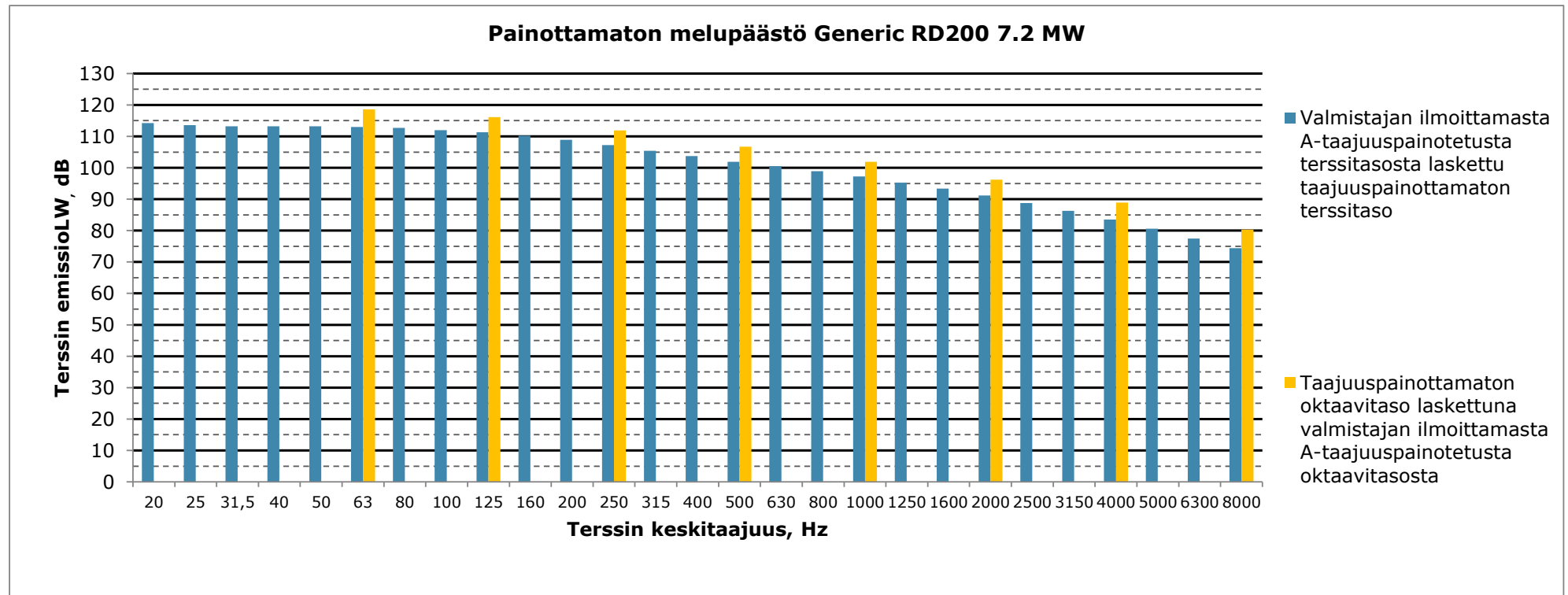
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus T
(Kärsämäenneva), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84%
persentiili mukaan**

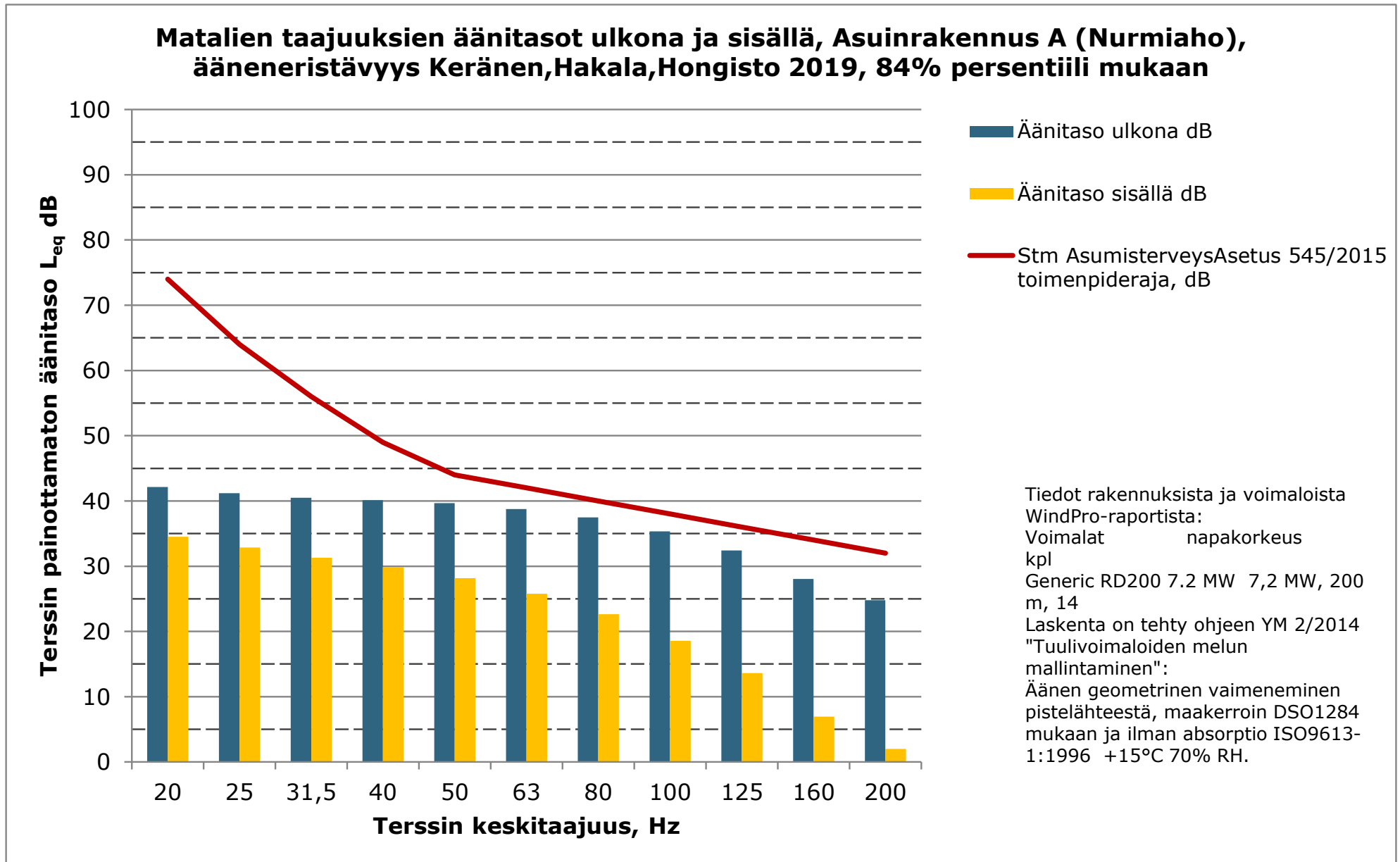


6.5.2024

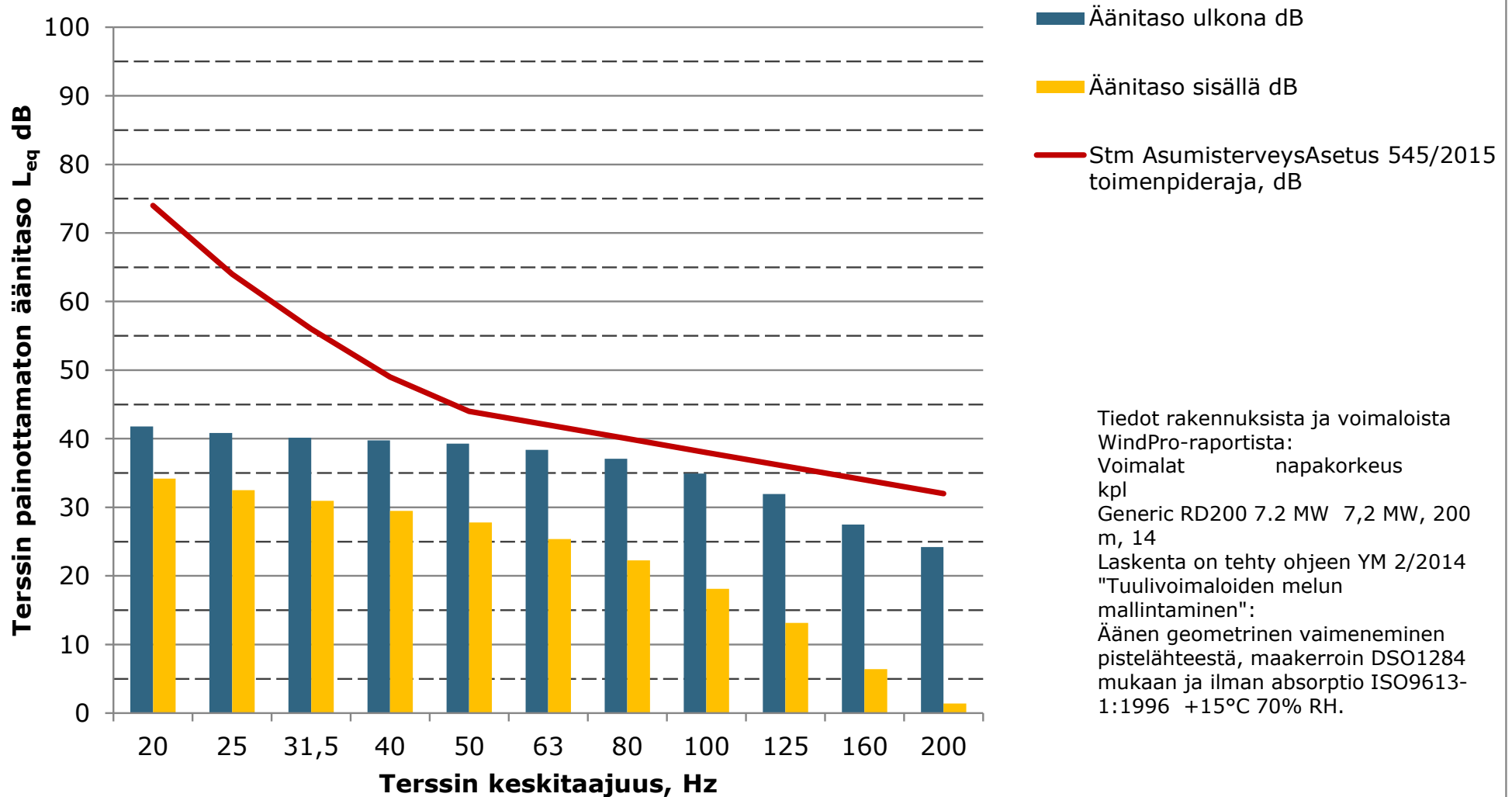
**Liite 6. Pilpänkankaan tuulivoimahanke – matalataajuisen melun rakennuskohtaiset arvot VE3
Generic RD200–7.2 MW.**



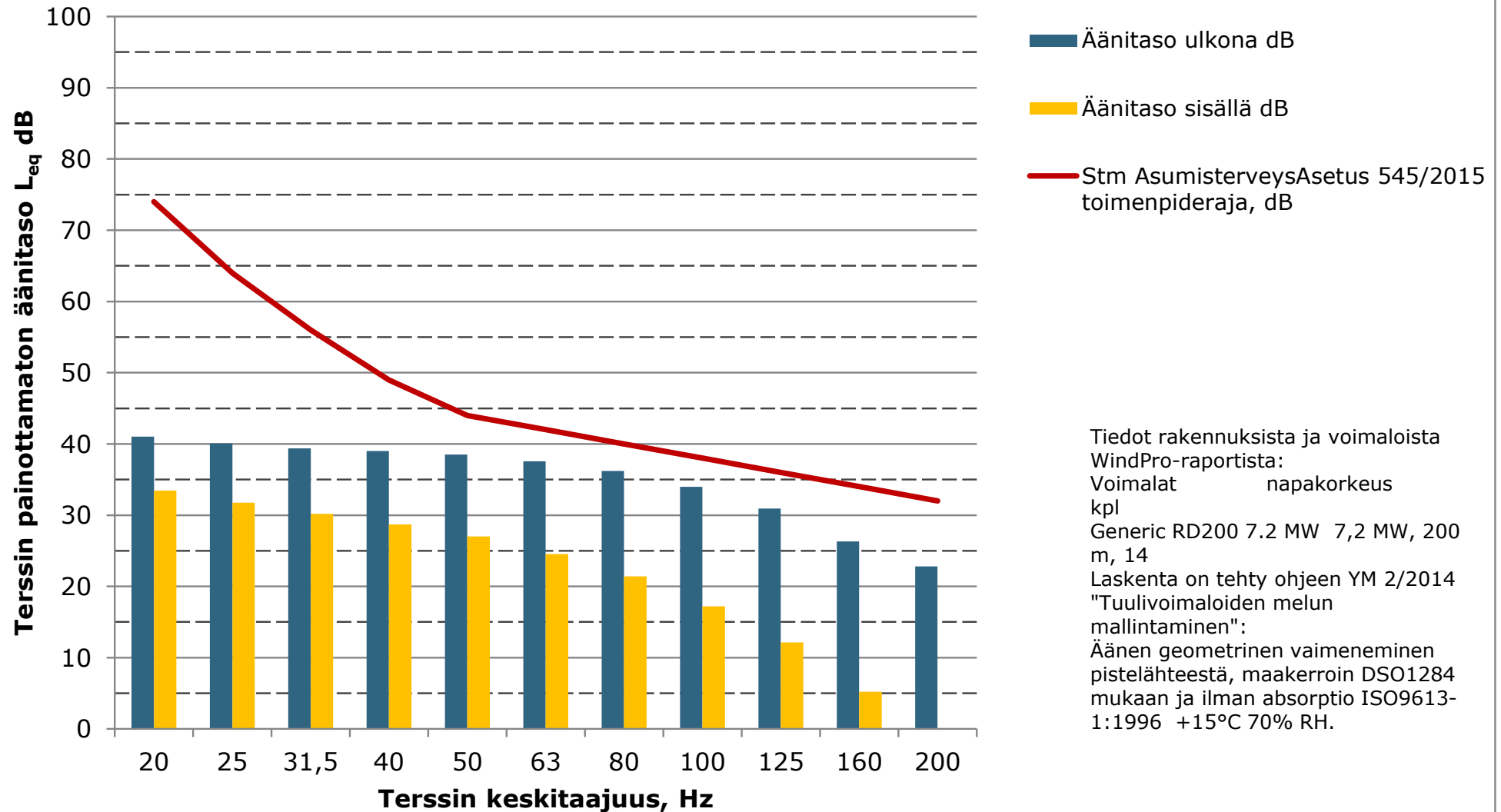




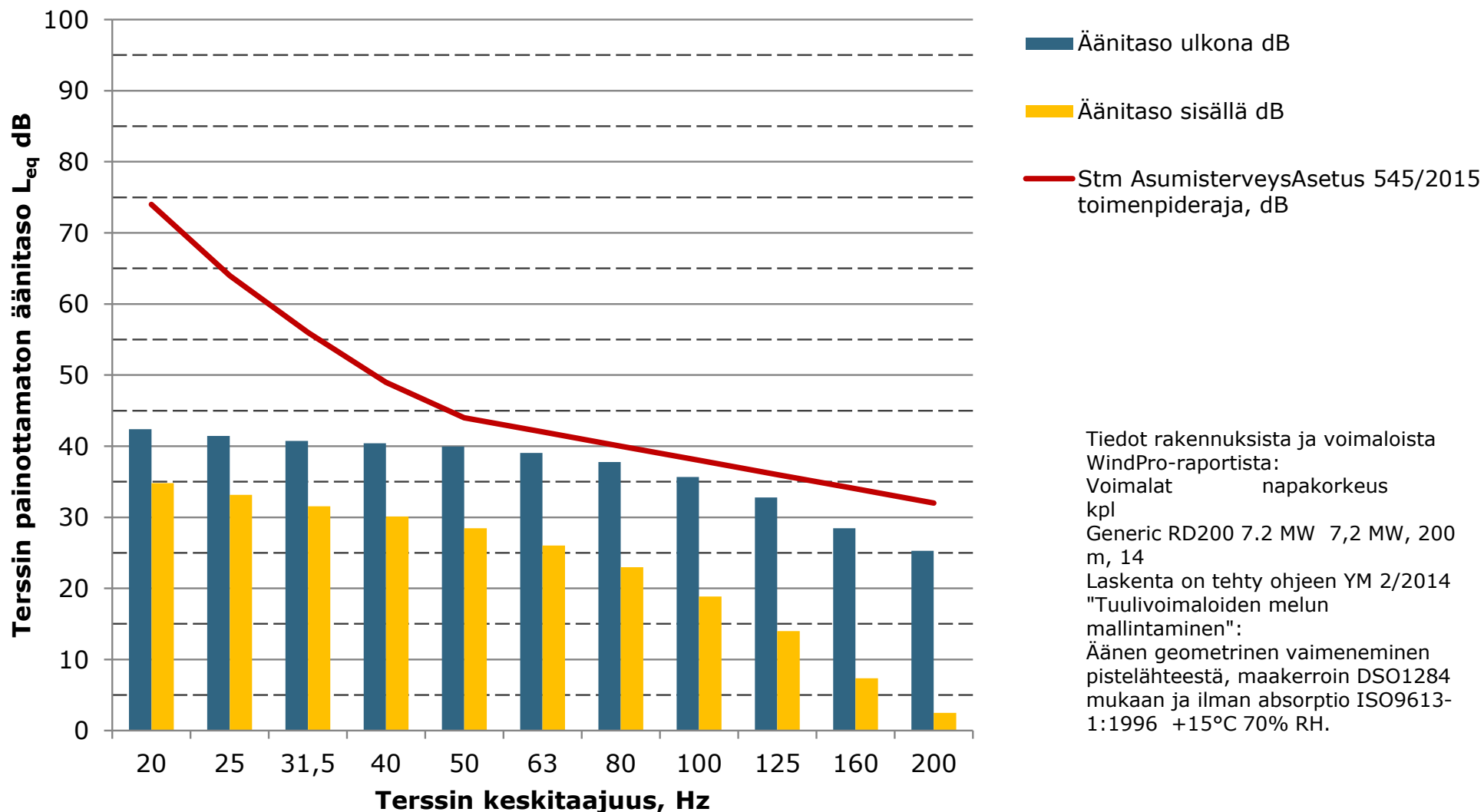
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus B
(Kivikangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**

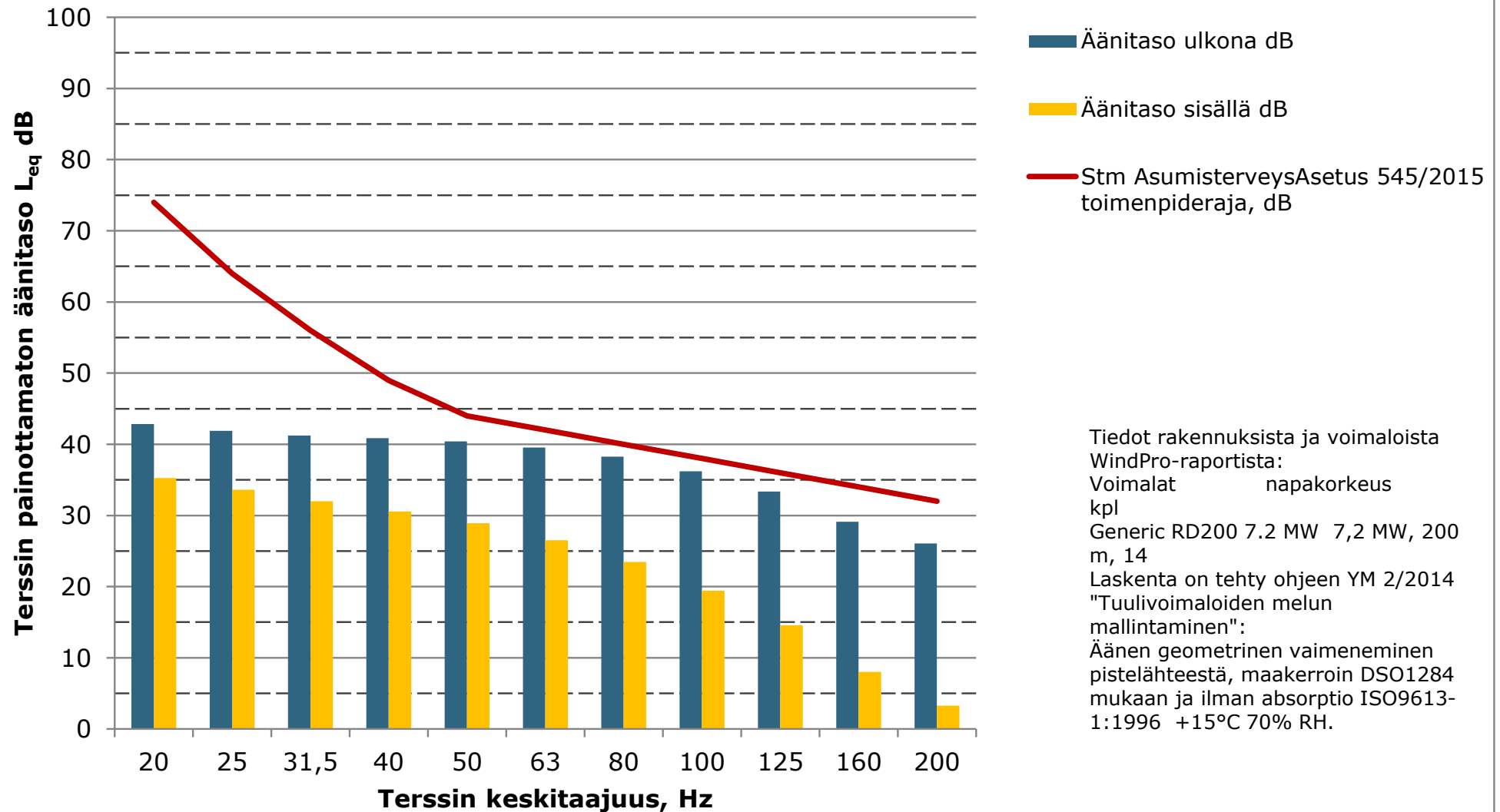


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C (Koukkula), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

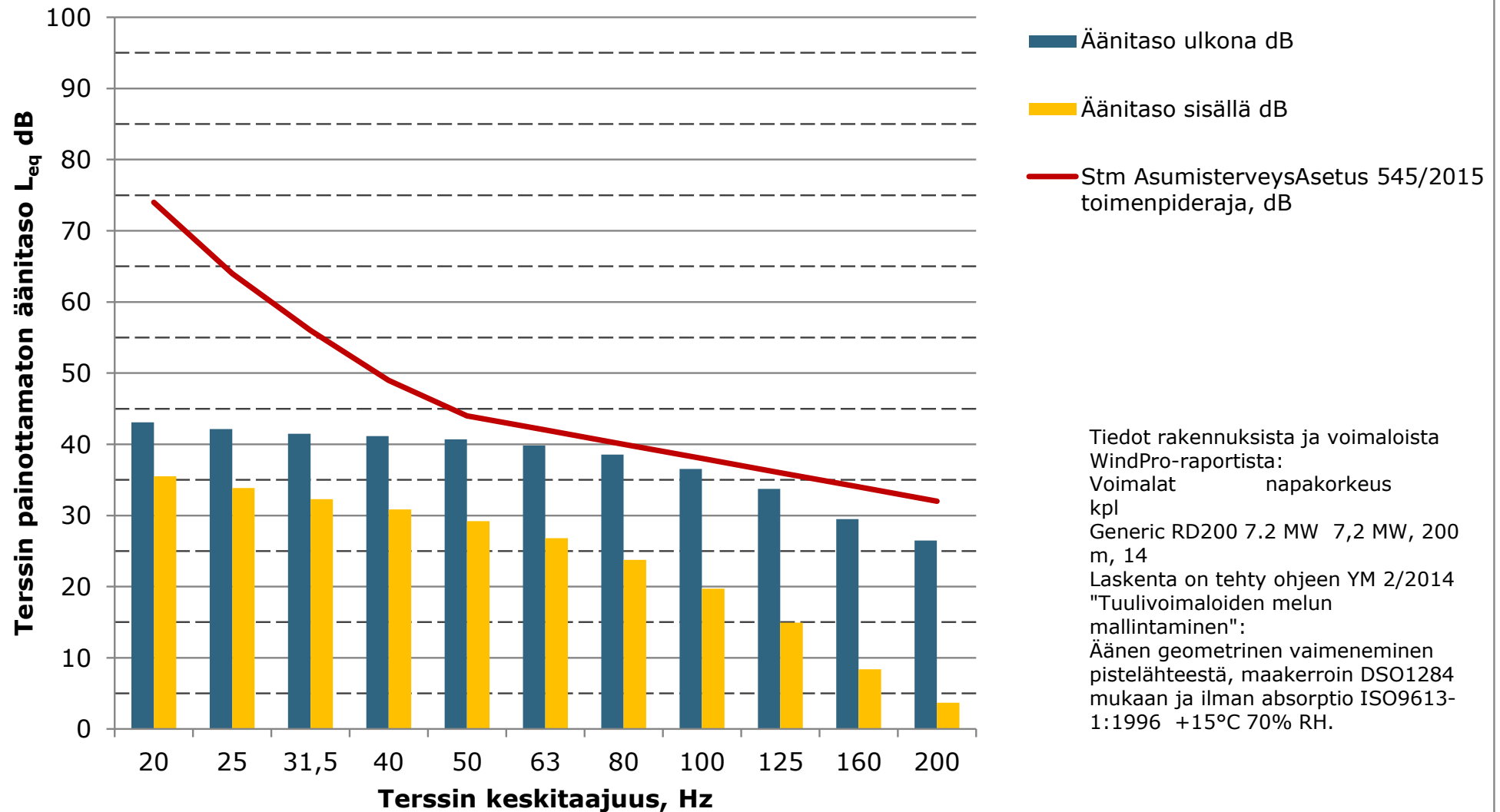


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus D (Konola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

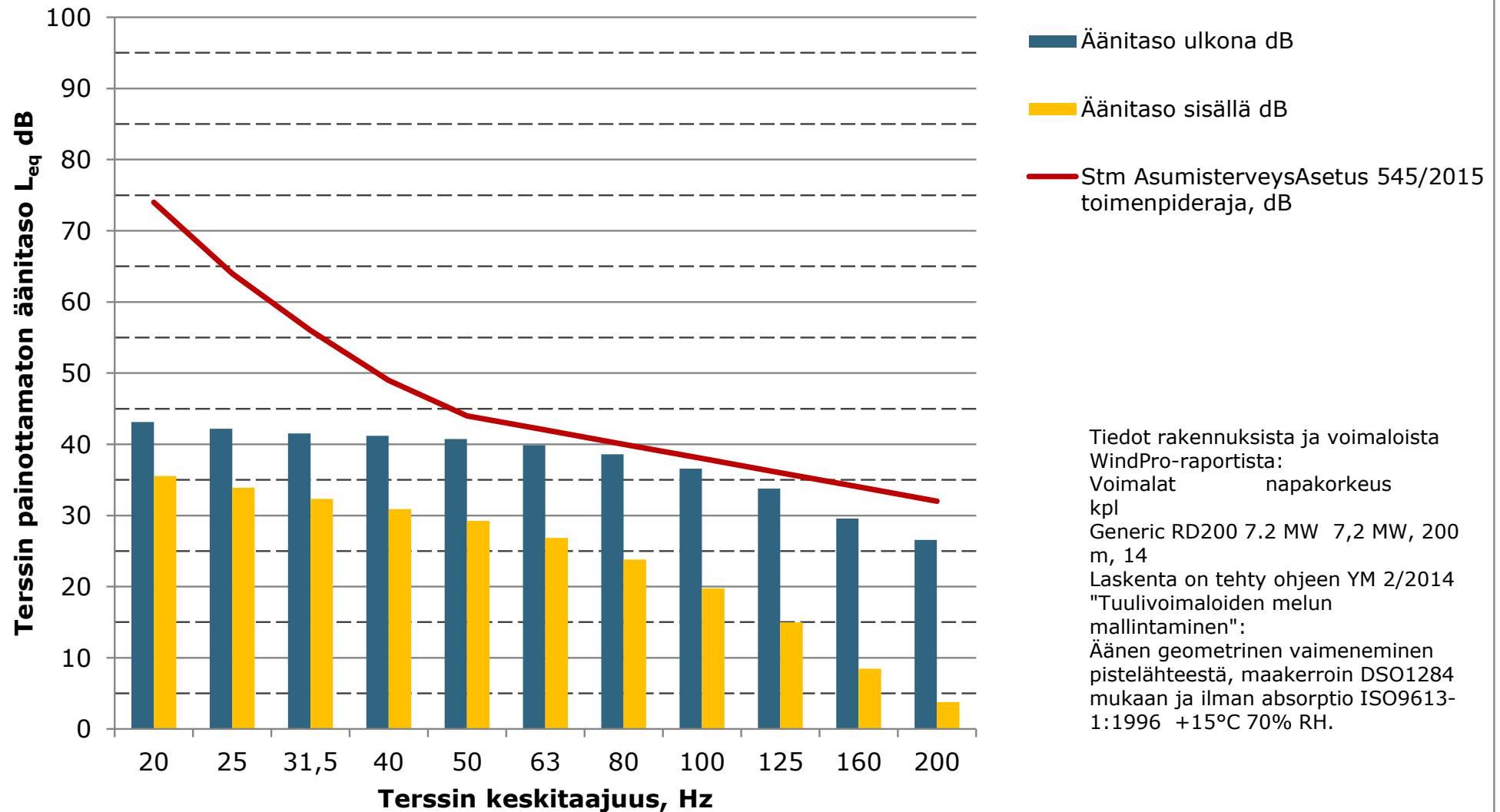


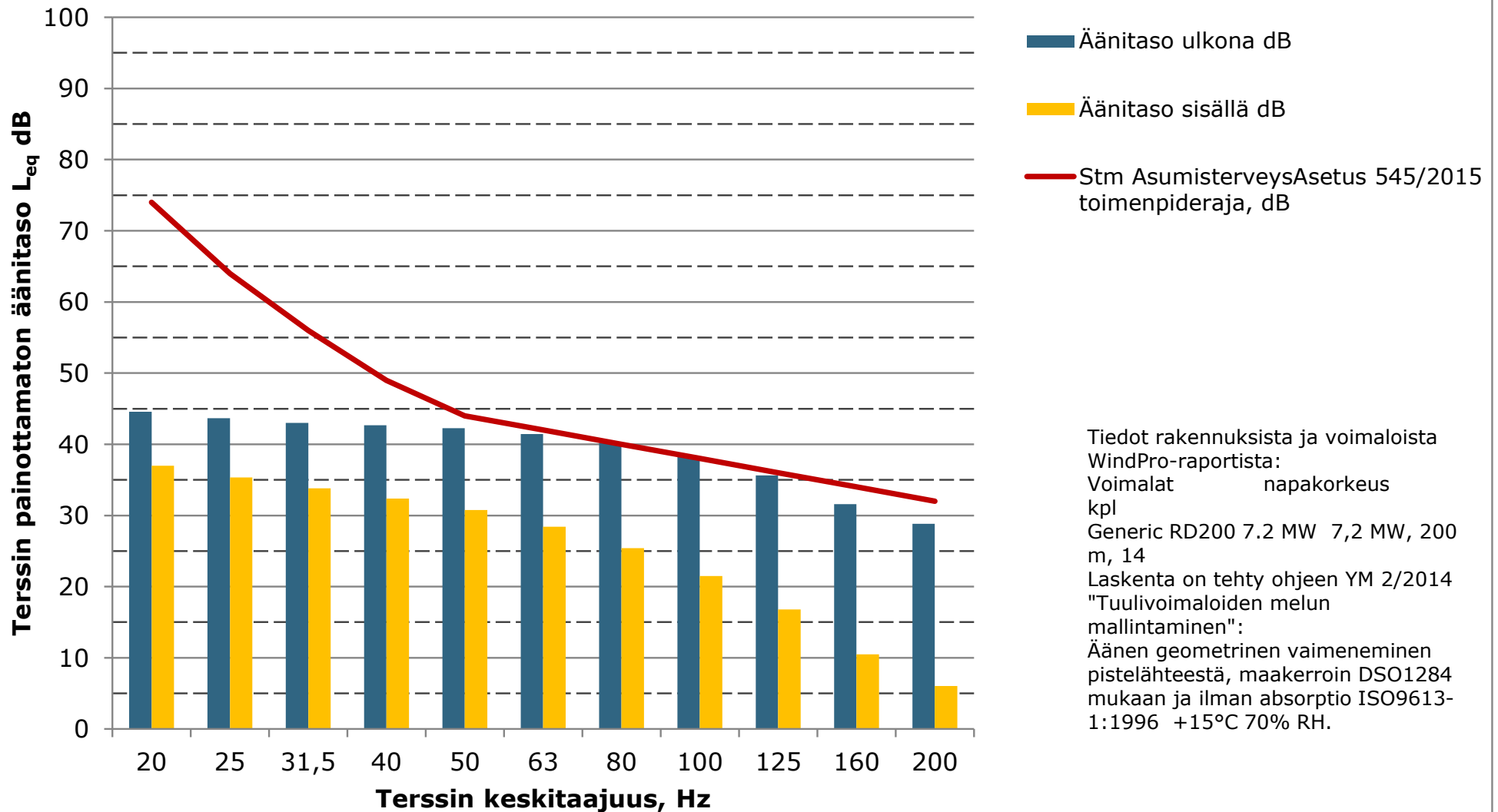
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus E (Piippo),
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**

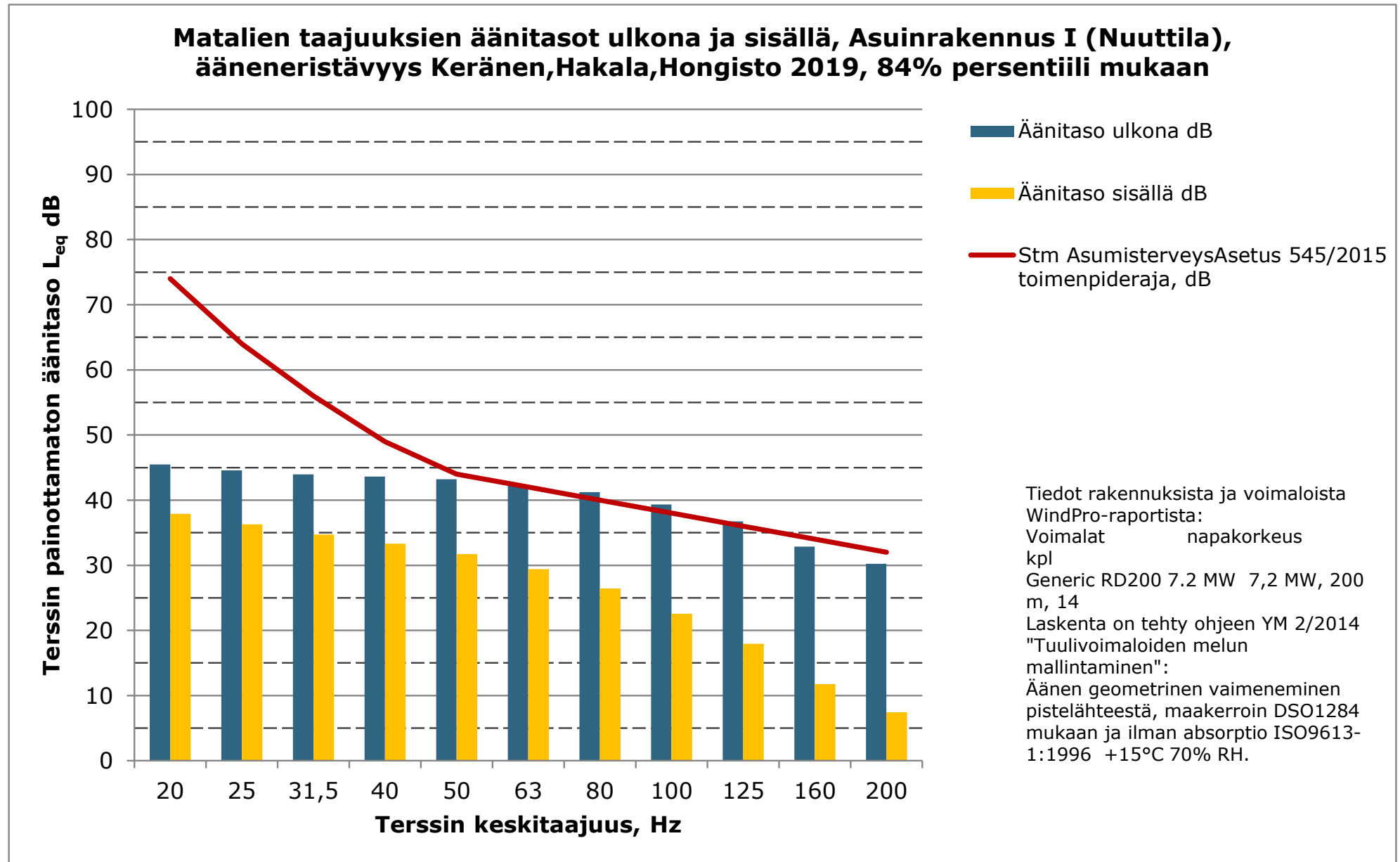
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Pääkkö), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



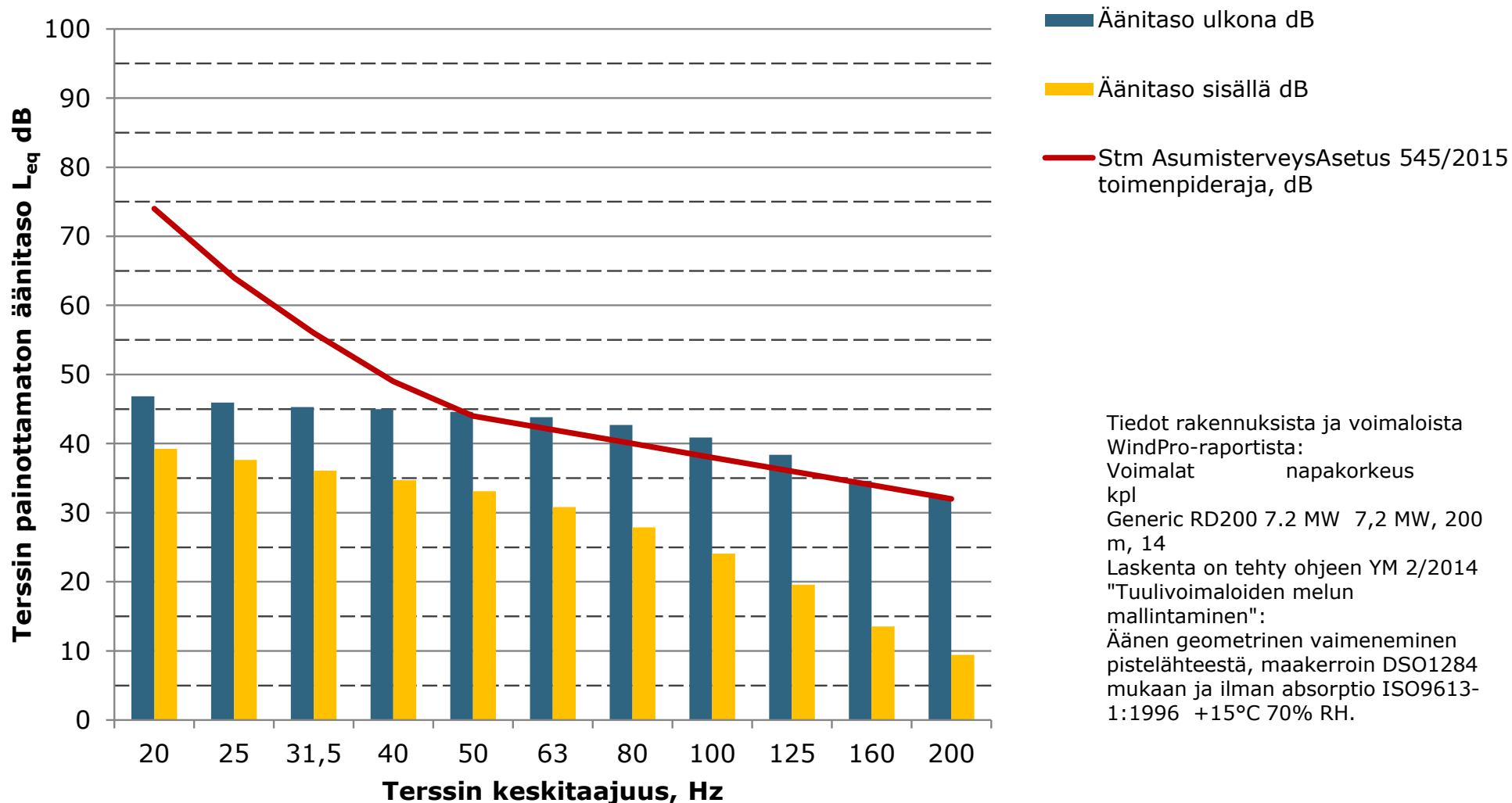
Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakenus G (Pääkkölä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

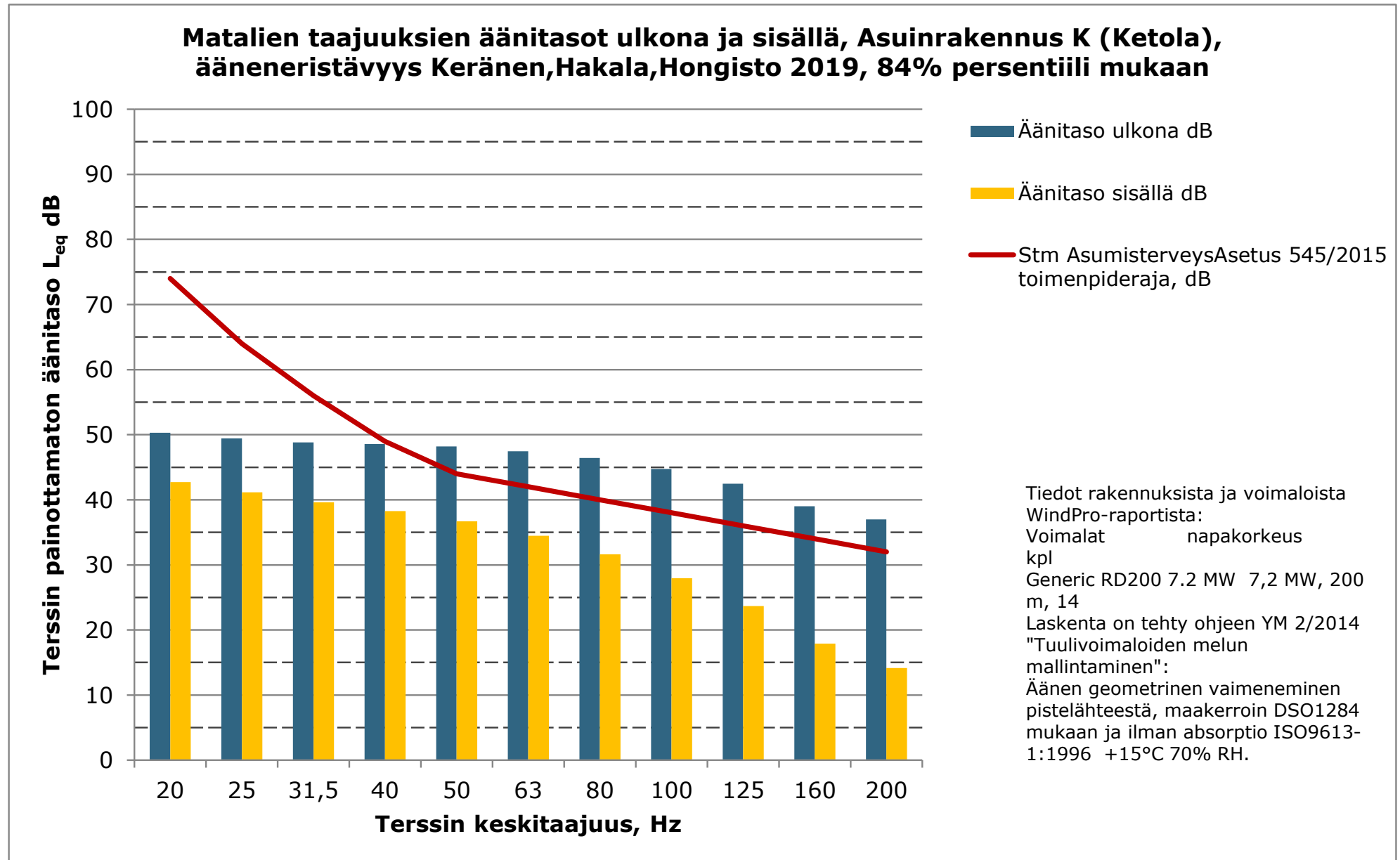


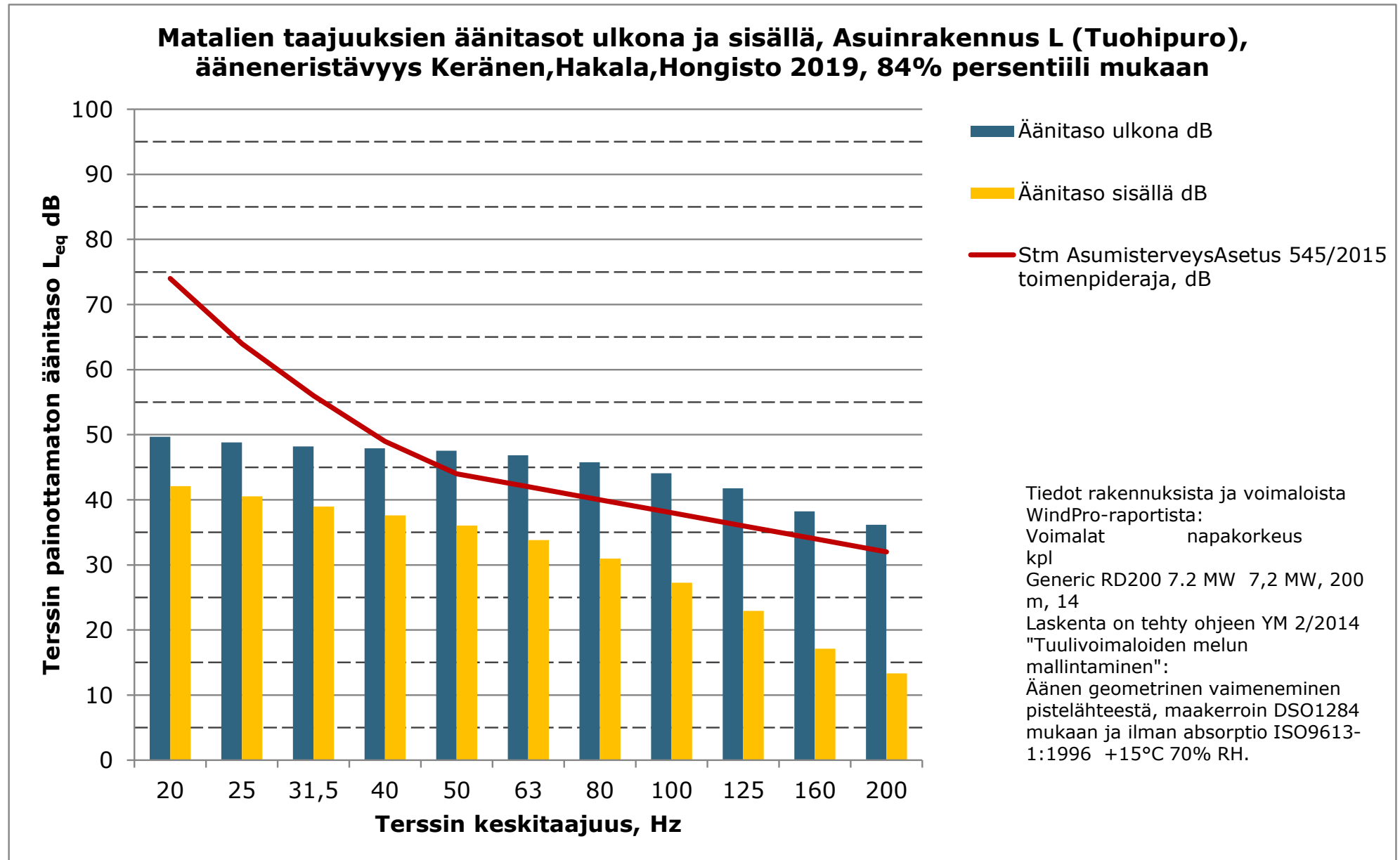
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Peltola),
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



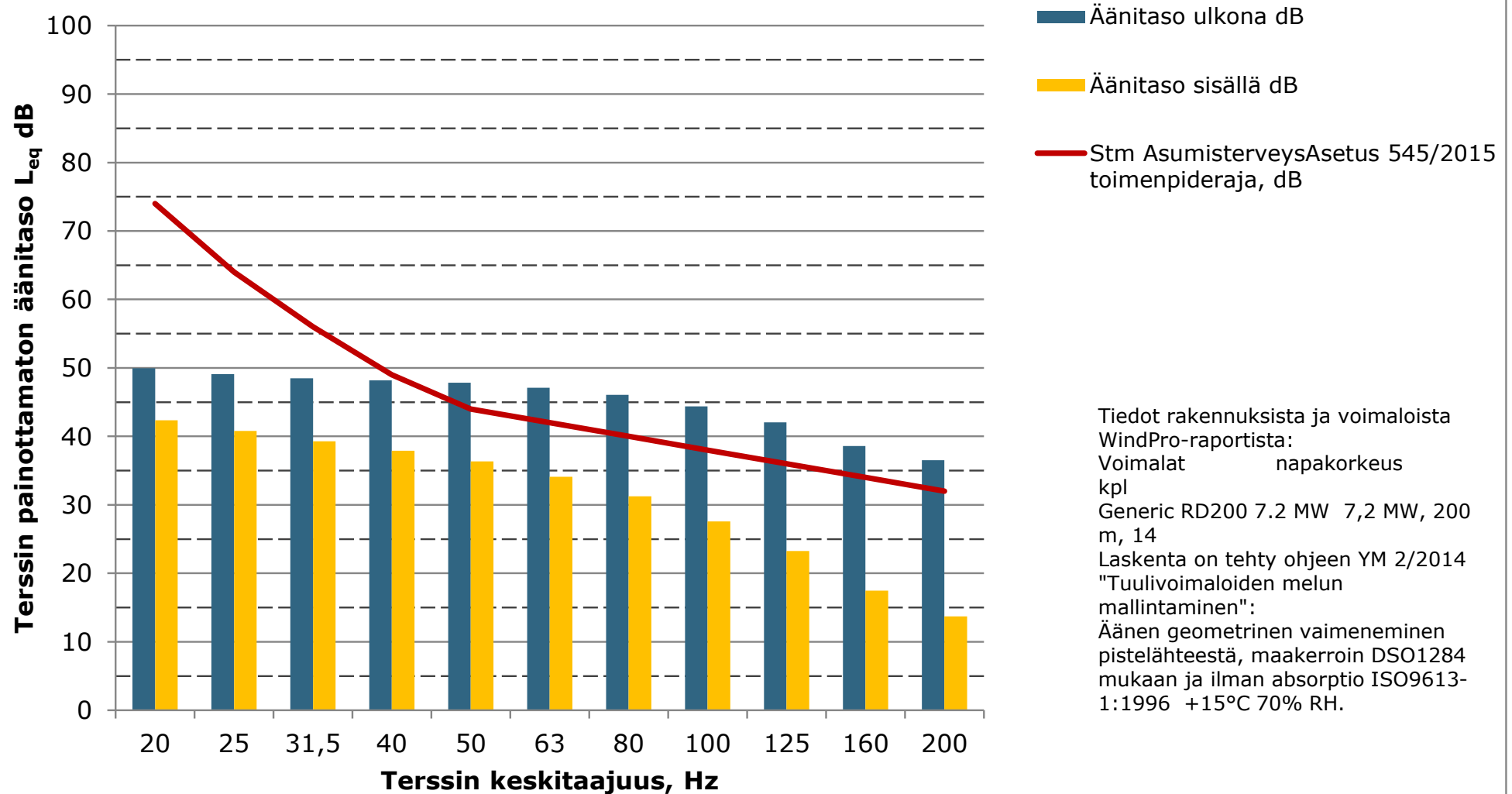
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus J
(Ahmokangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



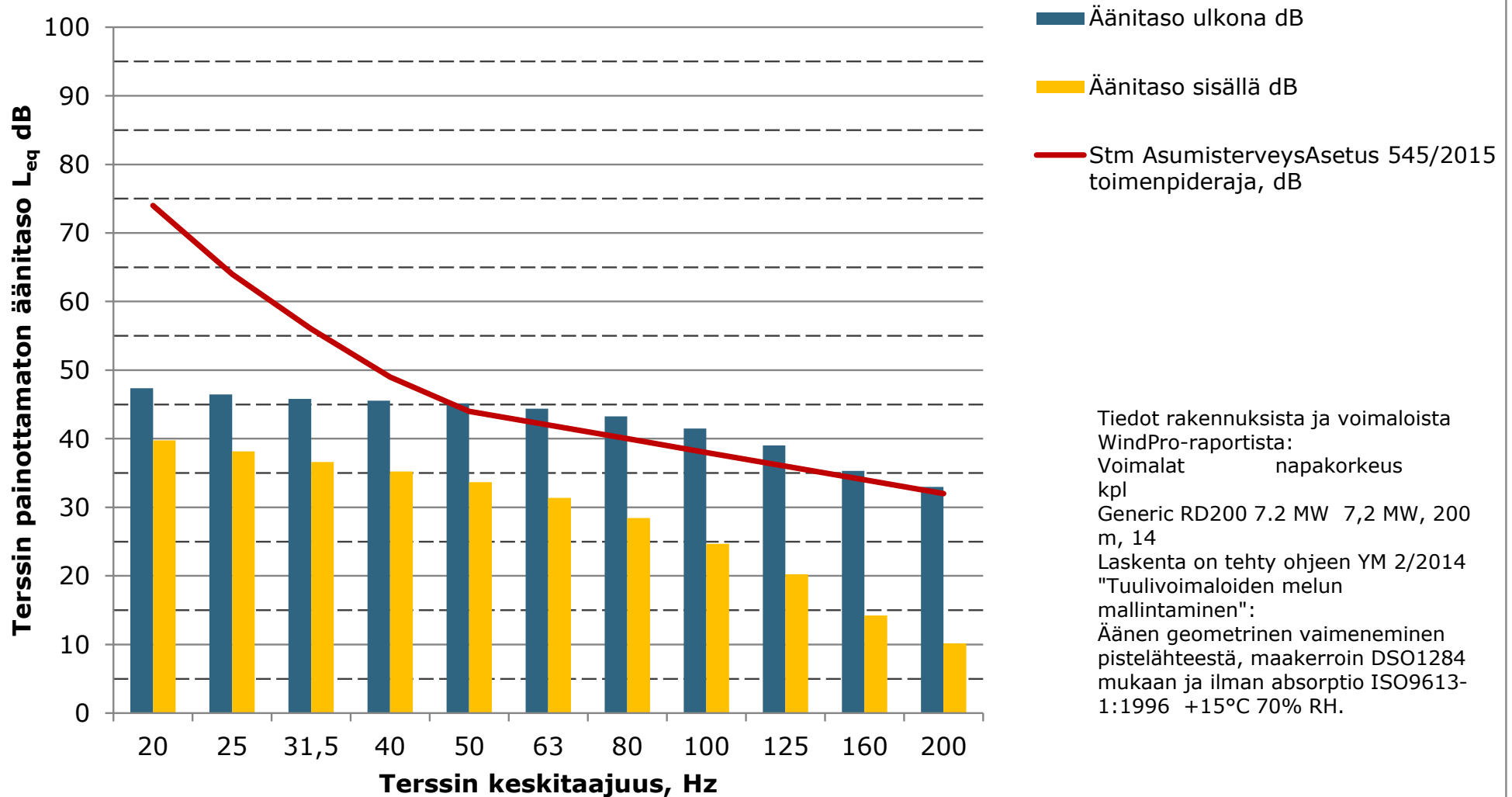


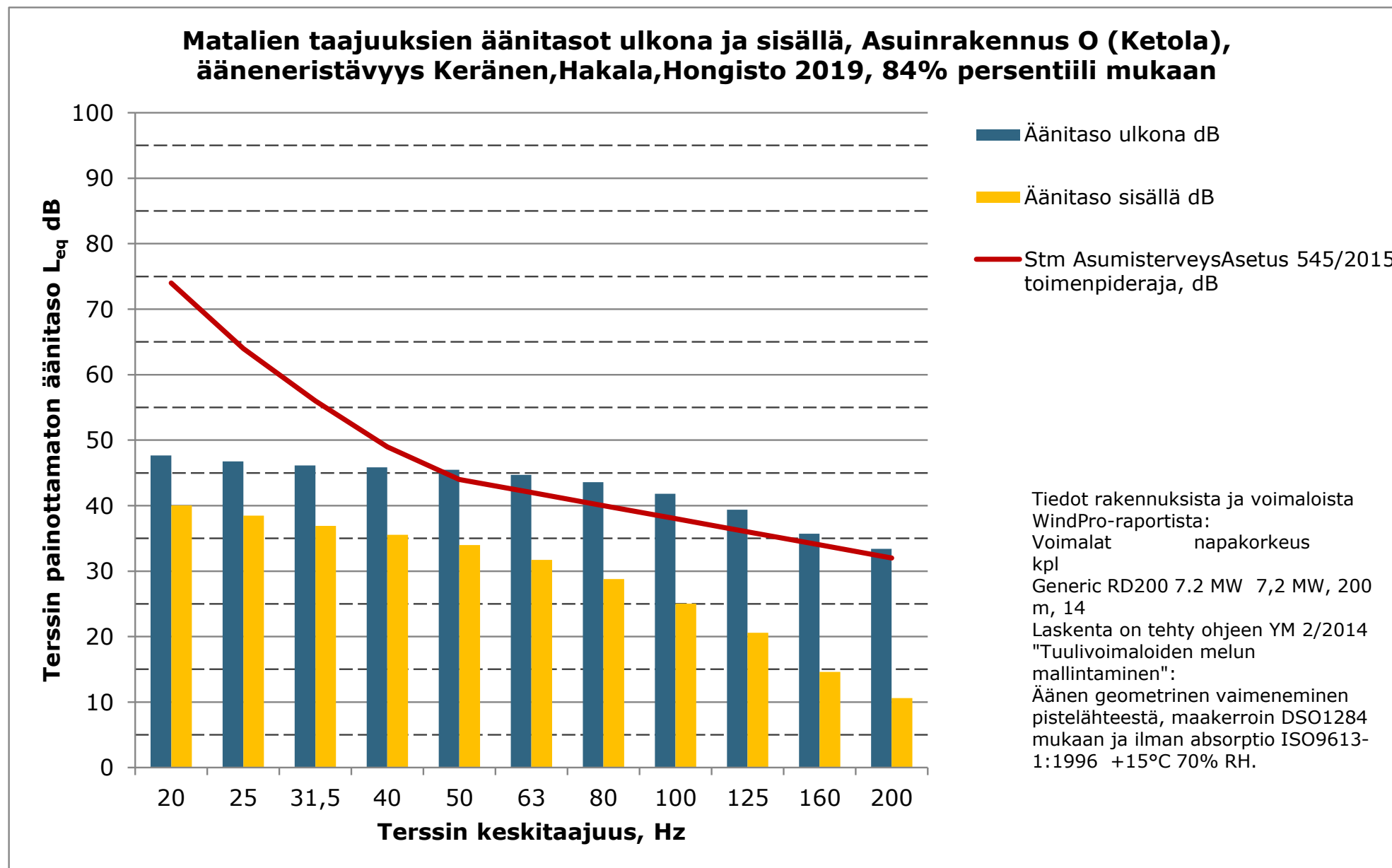


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus M
(Pilpanperä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**

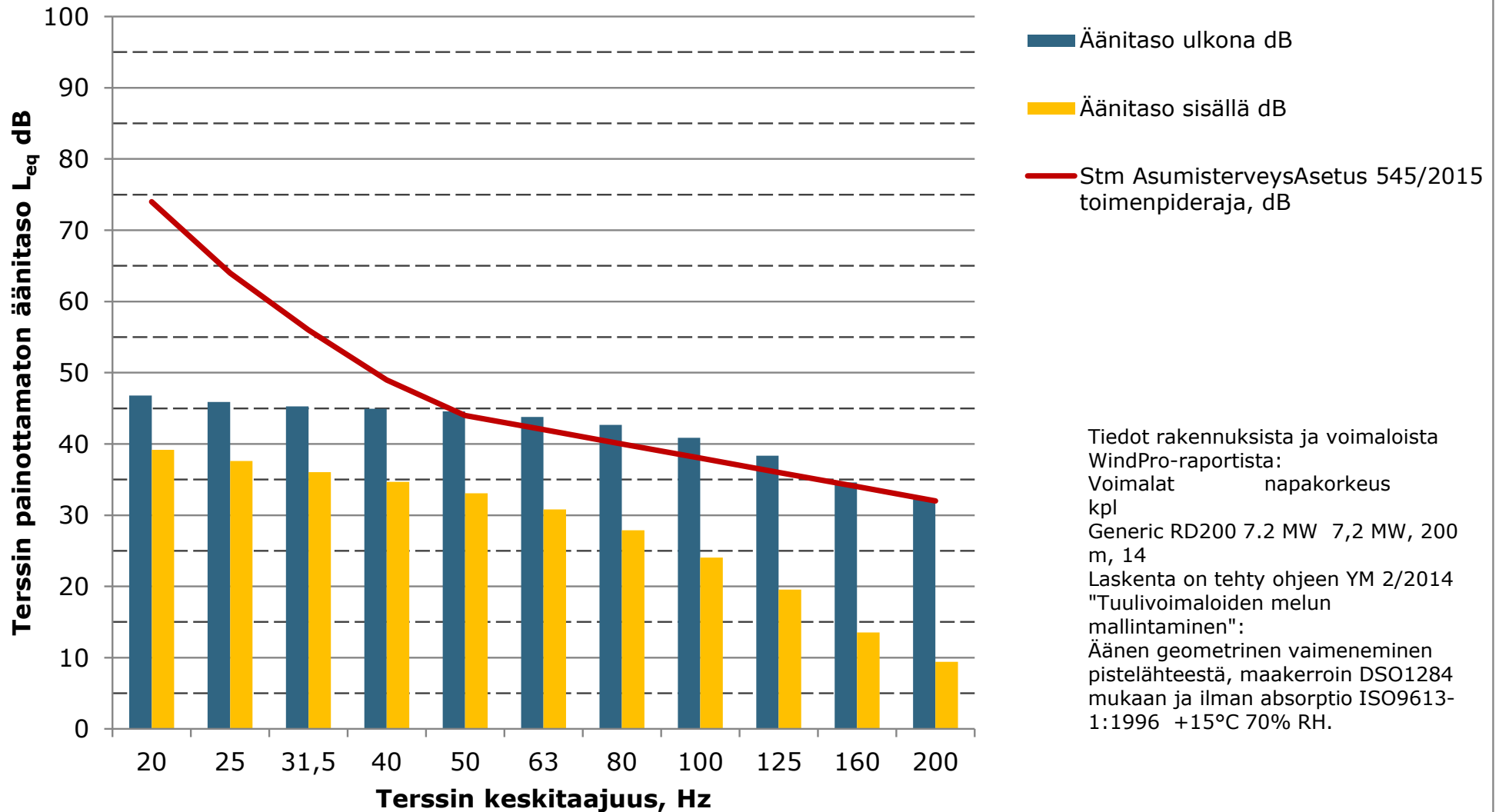


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus N
(Hanhikaarto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**

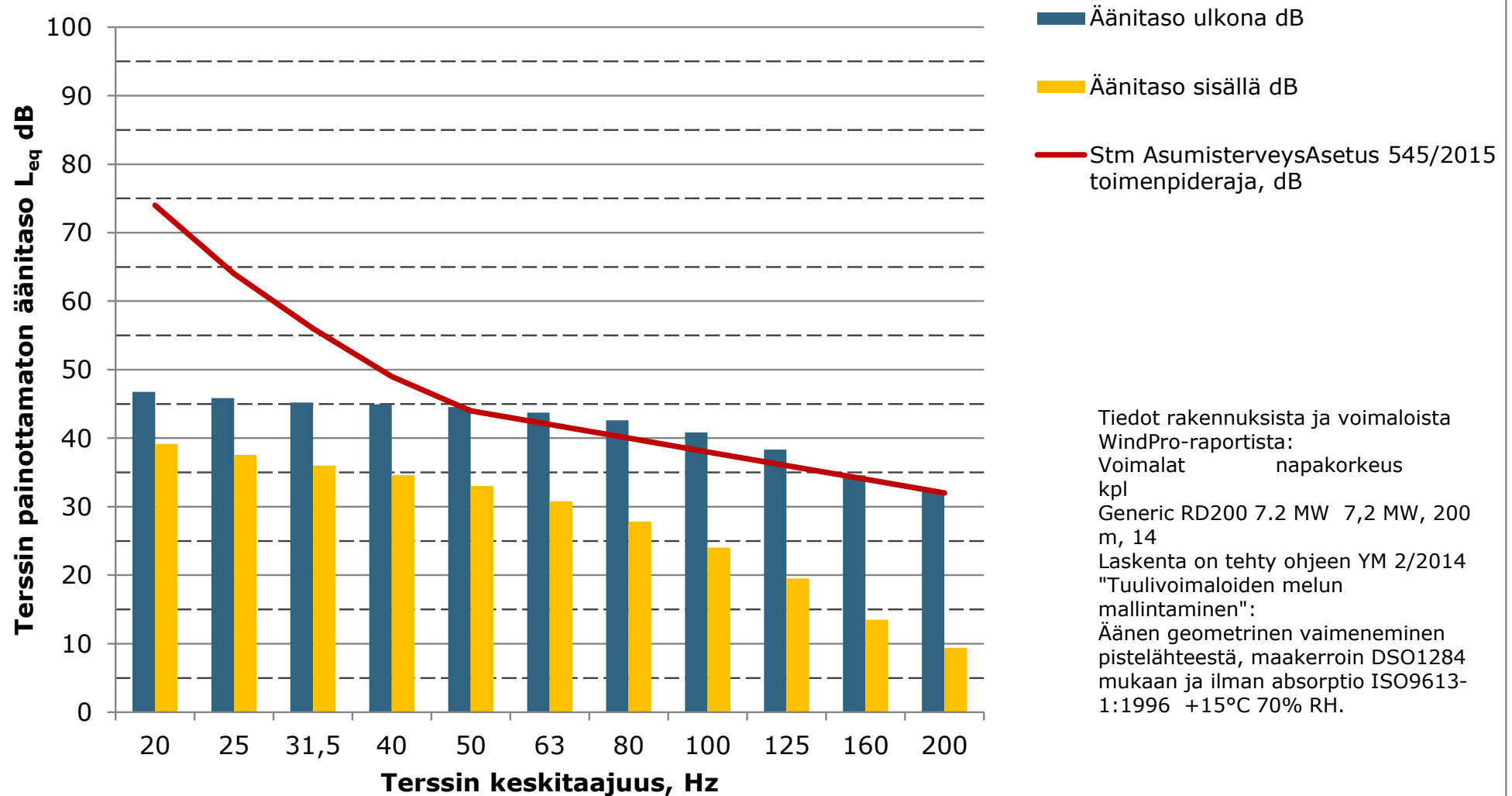




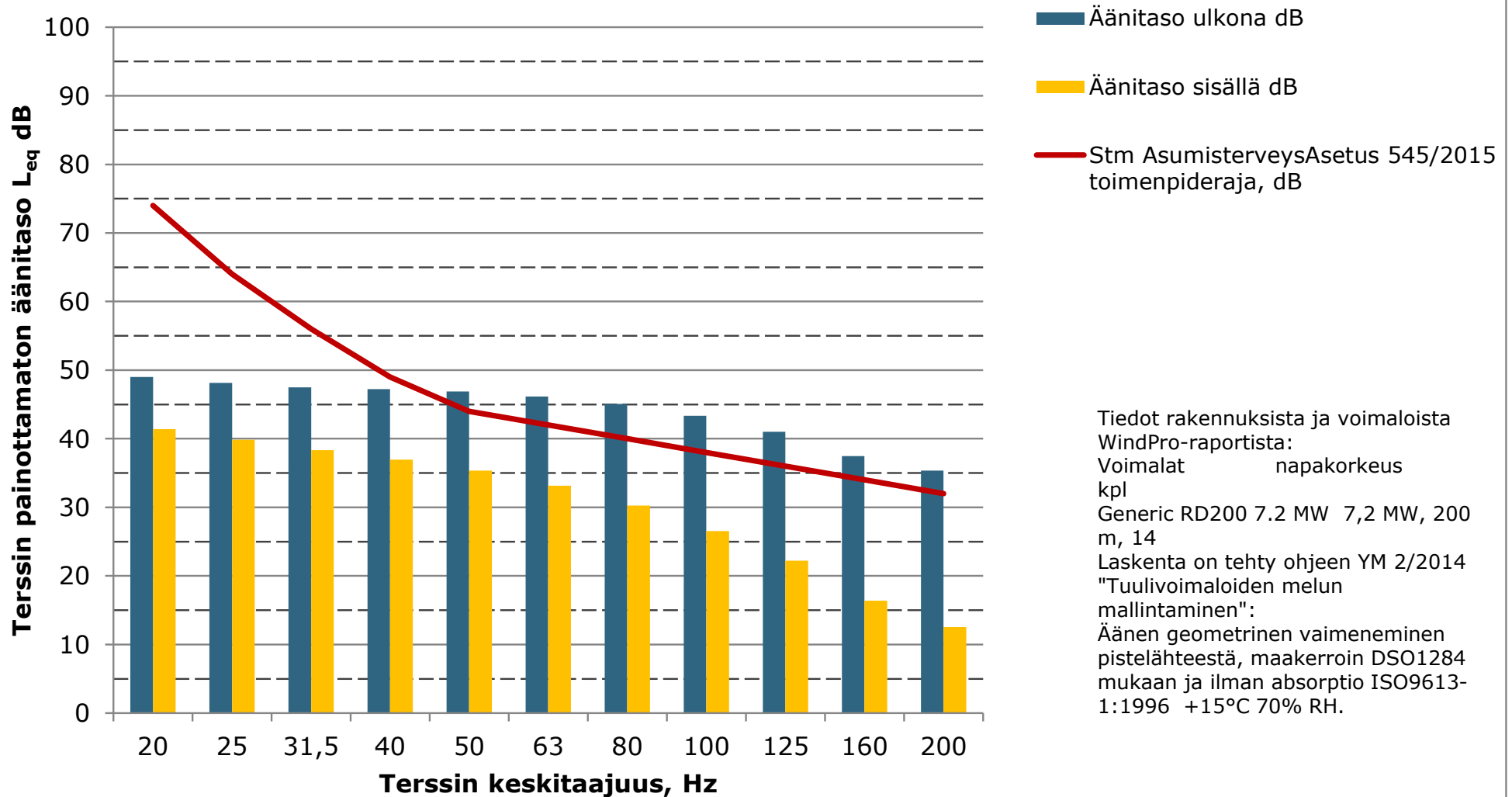
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus P (Kuistila),
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**

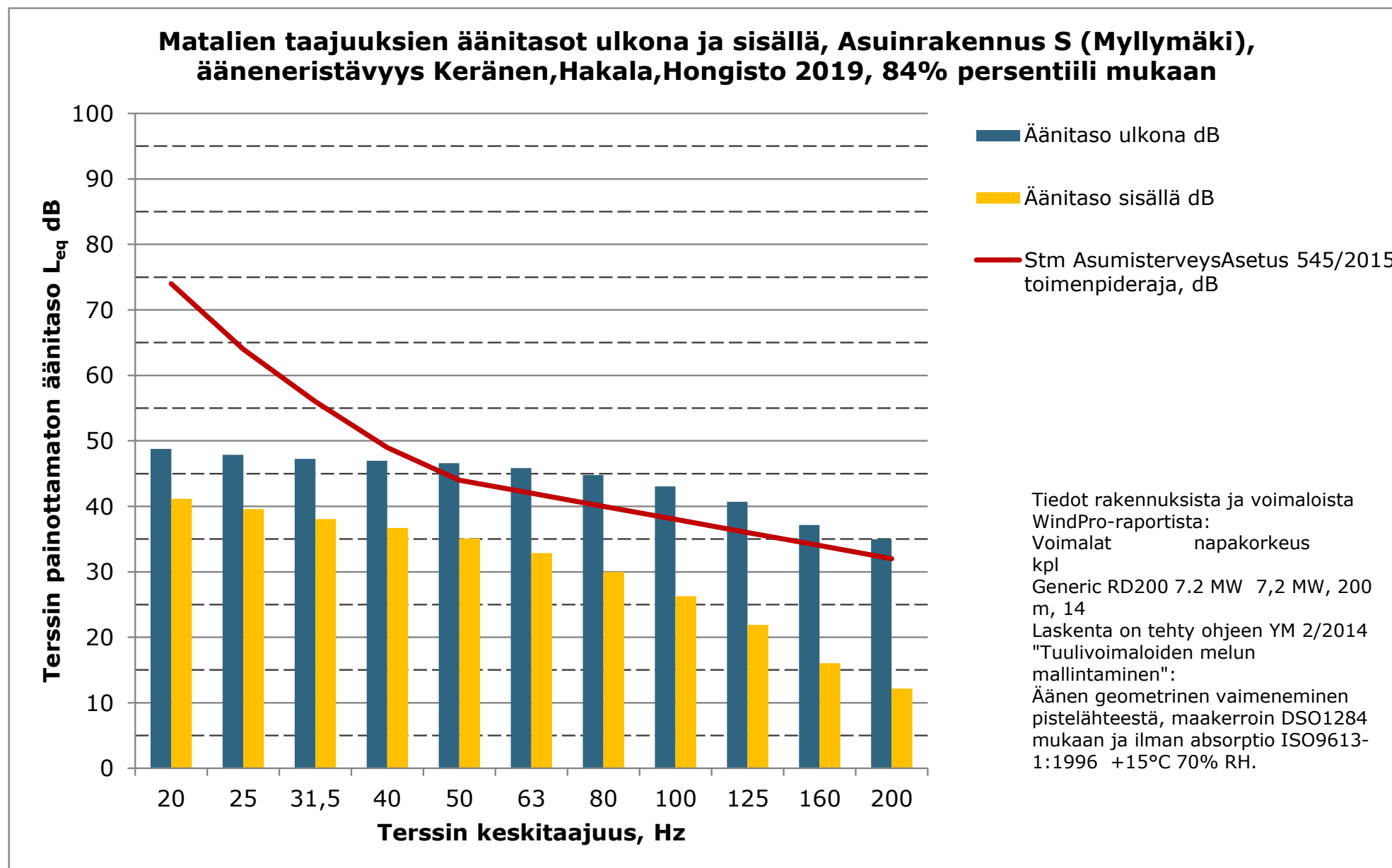


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus Q
(Hautalehto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**

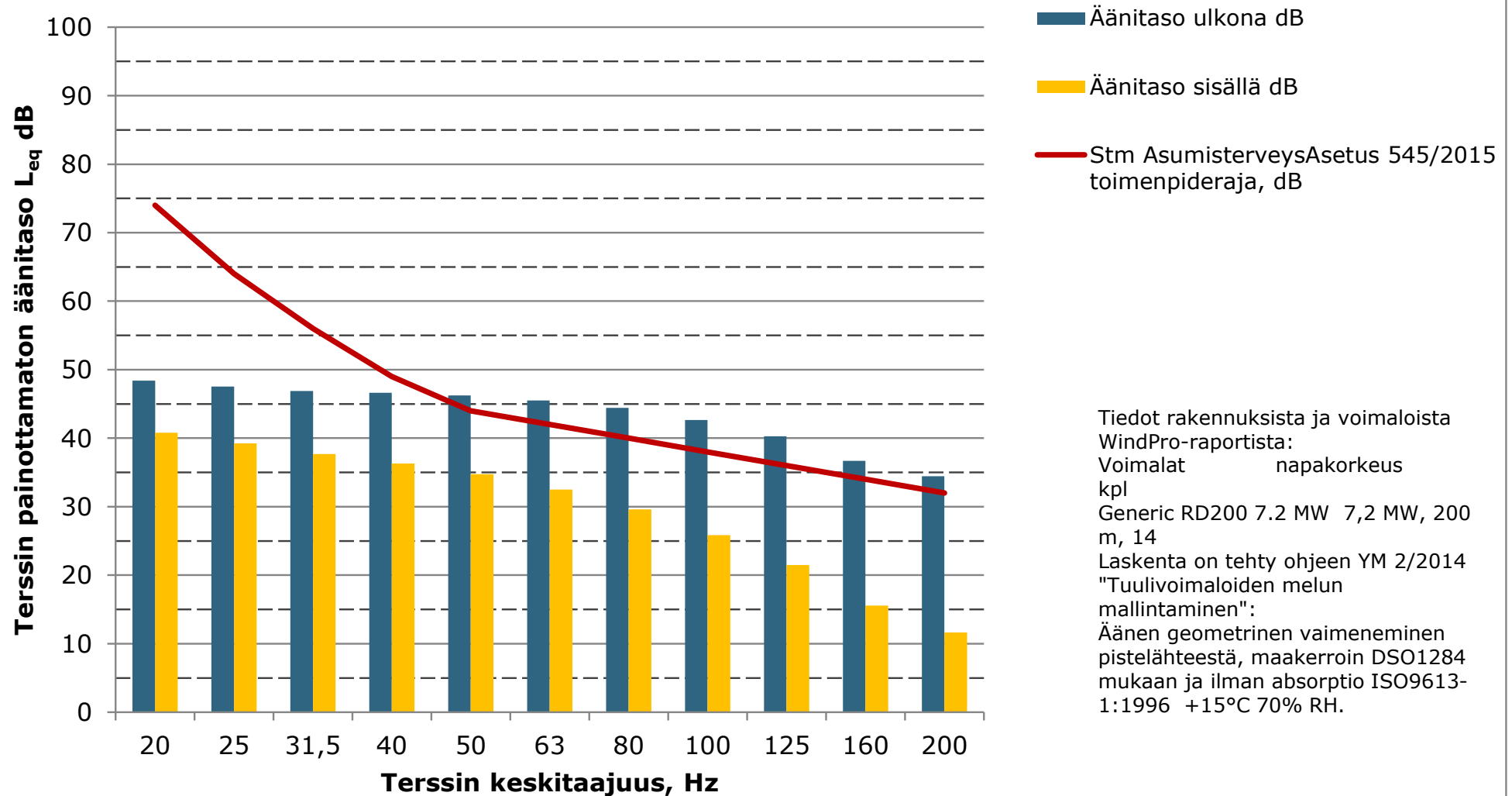


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus R
(Korpelanperä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**





**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus T
(Kärsämäenneva), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



6.5.2024

Liite 7. Pilpänkankaan tuulivoimahanke – varjostusmallinnuksen tulokset ”real case, no forest” (VE1).

Project:

Pyhätä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

12.4.2024 12.25/3.6.377

SHADOW - Main Result

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_No forest

Assumptions for shadow calculations

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,46	4,19	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational hours are calculated from WTGs in calculation and wind distribution:

MERRA_N64,00_E026,002 (7)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
534	407	418	444	537	869	1 042	1 023	923	826	708	685	8 415

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE_Pyhätä_Pilpankanga

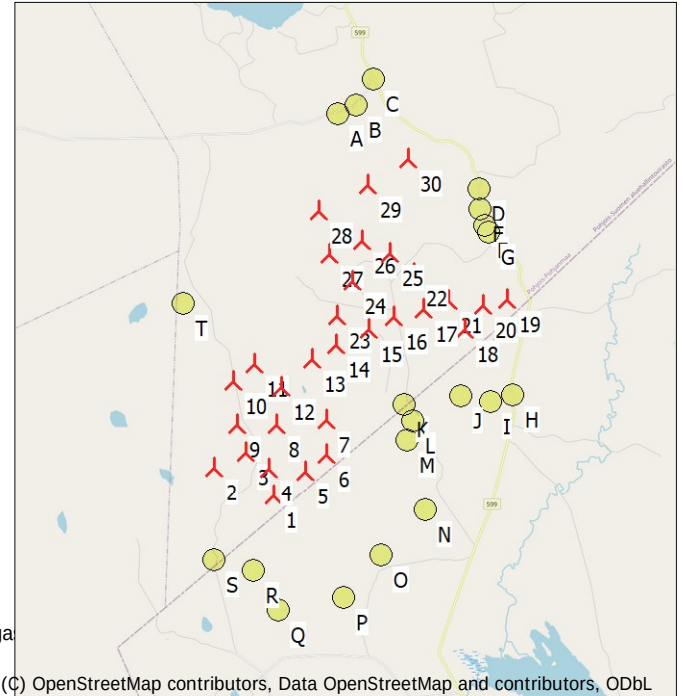
Receptor grid resolution: 1,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM [RPM]
			[m]									
1	465 686	7 082 467	165,4	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
2	464 106	7 083 255	147,6	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
3	464 951	7 083 636	154,2	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
4	465 561	7 083 192	163,3	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
5	466 536	7 083 117	165,1	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
6	467 111	7 083 592	159,6	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
7	467 136	7 084 492	159,4	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
8	465 786	7 084 367	164,6	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
9	464 736	7 084 392	152,2	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
10	464 636	7 085 517	155,2	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
11	465 236	7 085 992	159,1	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
12	465 936	7 085 367	160,8	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
13	466 761	7 086 117	170,0	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
14	467 386	7 086 467	159,7	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
15	468 261	7 086 867	156,9	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
16	468 936	7 087 192	156,2	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
17	469 711	7 087 392	157,4	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
18	470 821	7 086 831	160,6	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
19	471 948	7 087 636	182,5	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
20	471 311	7 087 492	168,0	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
21	470 411	7 087 617	162,5	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
22	469 511	7 088 317	160,5	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
23	467 436	7 087 242	169,3	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
24	467 861	7 088 142	165,0	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
25	468 861	7 088 892	163,0	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
26	468 133	7 089 218	165,0	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
27	467 261	7 088 867	167,0	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
28	466 998	7 090 015	168,4	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
29	468 282	7 090 703	164,5	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
30	469 365	7 091 361	164,5	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

Scale 1:200 000

New WTG

Shadow receptor

SHADOW - Main Result

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_No forest

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (Nurmiaho)	467 539	7 092 595	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Kivikangas)	467 993	7 092 829	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakenus G (Pääkkölä)	471 494	7 089 419	197,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Nuuttila)	471 499	7 084 904	165,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomarakenus J (Ahmokaarto)	470 723	7 085 089	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Lomarakenus P (Kuistila)	467 531	7 079 776	162,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Lomarakenus R (Korpelanperä)	465 124	7 080 510	140,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Lomarakenus T (Kärsämäenneva)	463 349	7 087 611	152,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values Shadow hours per year [h/year]
A	Asuinrakennus A (Nurmiaho)	2:43
B	Asuinrakennus B (Kivikangas)	3:03
C	Asuinrakennus C (Koukkula)	0:00
D	Asuinrakennus D (Konola)	2:40
E	Asuinrakennus E (Piippo)	0:00
F	Asuinrakennus F (Pääkkö)	3:31
G	Lomarakenus G (Pääkkölä)	4:22
H	Asuinrakennus H (Peltola)	0:45
I	Asuinrakennus I (Nuuttila)	0:00
J	Lomarakenus J (Ahmokaarto)	0:00
K	Asuinrakennus K (Ketola)	1:41
L	Asuinrakennus L (Tuohipuro)	0:00
M	Asuinrakennus M (Pilpanperä)	3:50
N	Asuinrakennus N (Hanhikaarto)	0:00
O	Asuinrakennus O (Ketola)	0:00
P	Lomarakenus P (Kuistila)	0:00
Q	Asuinrakennus Q (Hautalehto)	0:00
R	Lomarakenus R (Korpelanperä)	0:00
S	Asuinrakennus S (Myllymäki)	0:00
T	Lomarakenus T (Kärsämäenneva)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
1	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (874)	0:00
2	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (872)	0:00
3	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (887)	0:00
4	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (890)	0:00
5	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (881)	0:00
6	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (870)	1:34
7	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (884)	3:58
8	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (869)	0:00
9	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (885)	0:00
10	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (879)	0:00
11	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (894)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_No forest

...continued from previous page

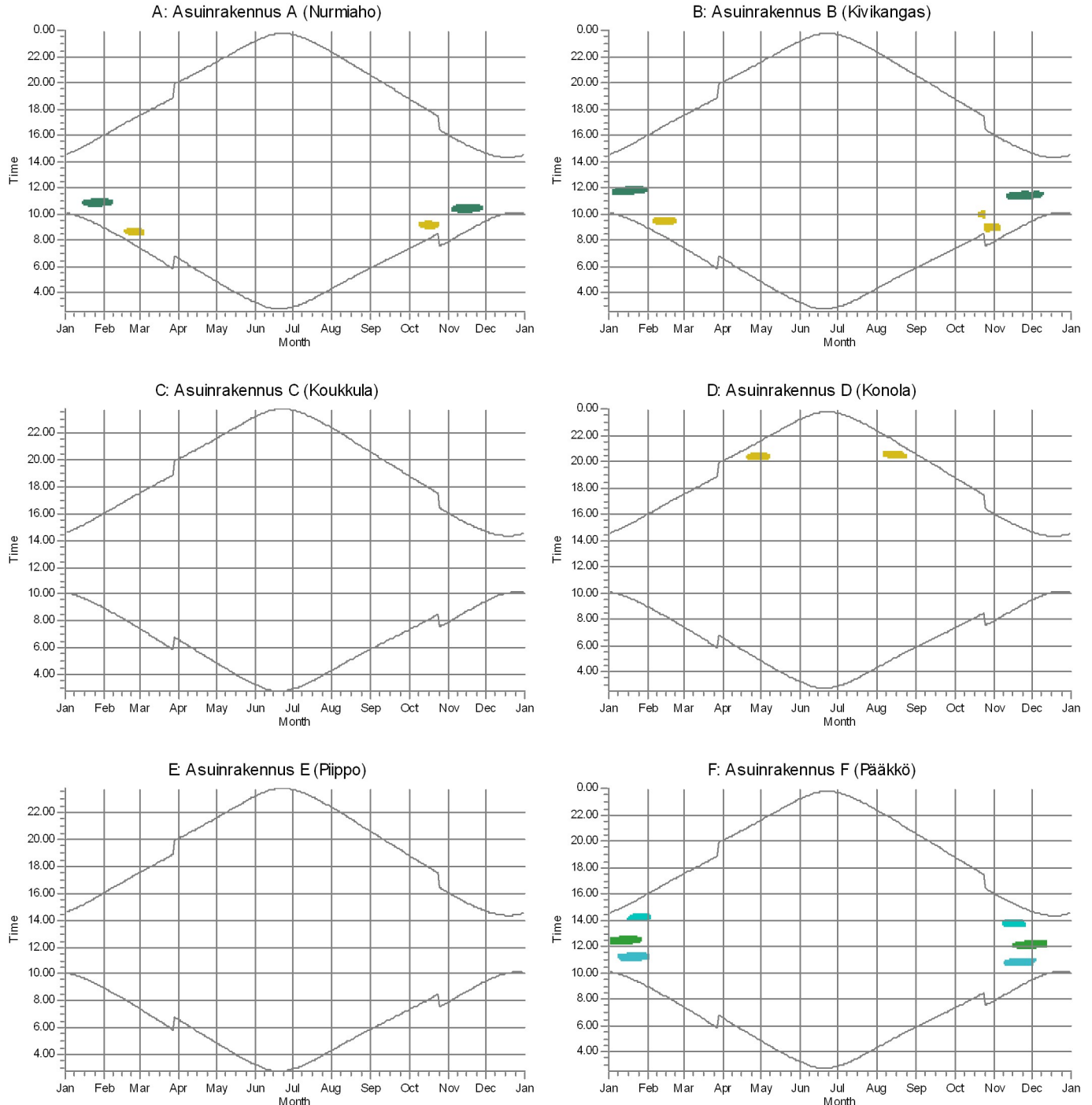
No.	Name	Expected [h/year]
12	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (891)	0:00
13	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (893)	0:00
14	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (886)	0:00
15	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (888)	0:00
16	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (871)	0:00
17	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (880)	0:00
18	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (877)	0:45
19	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (873)	2:05
20	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (882)	2:27
21	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (898)	1:52
22	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (892)	0:00
23	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (878)	0:00
24	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (895)	0:00
25	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (875)	0:00
26	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (889)	0:00
27	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (883)	0:00
28	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (897)	0:00
29	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (876)	2:49
30	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (896)	5:36

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

SHADOW - Calendar, graphical

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_No forest



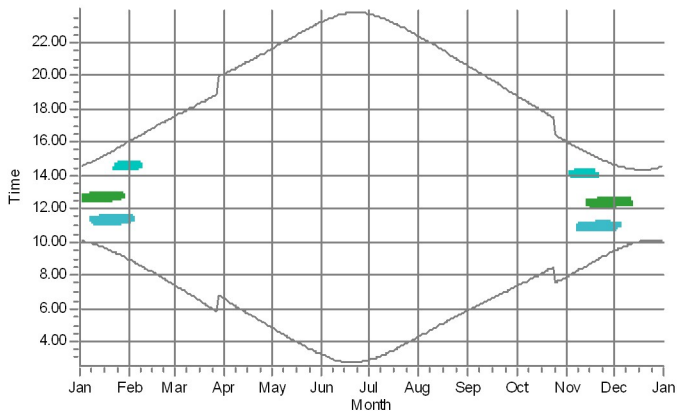
WTGs

- | | | |
|--|--|--|
| 19: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (873) | 21: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (898) | 30: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (896) |
| 20: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (882) | 29: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (876) | |

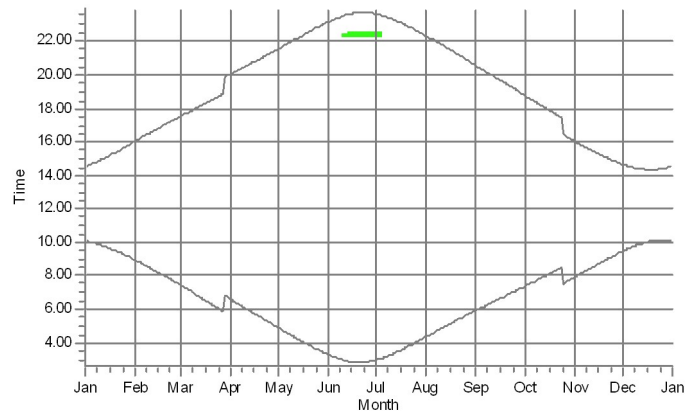
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_No forest

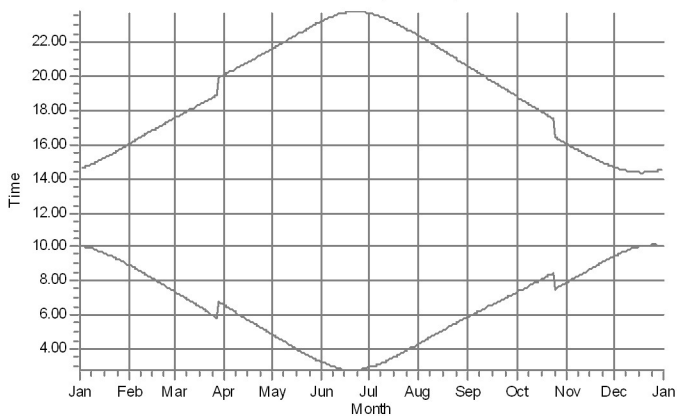
G: Lomarakenus G (Pääkkölä)



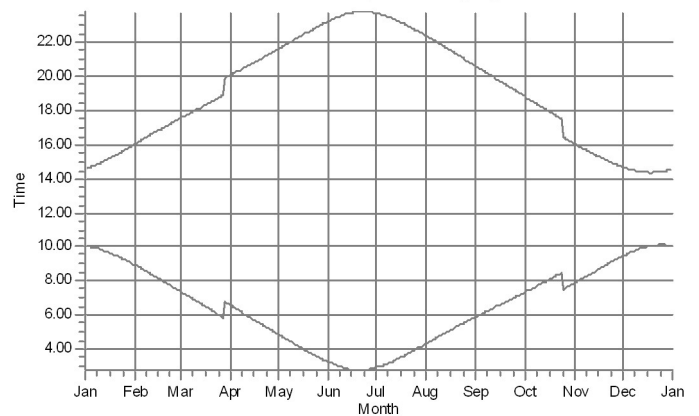
H: Asuinrakenus H (Peltola)



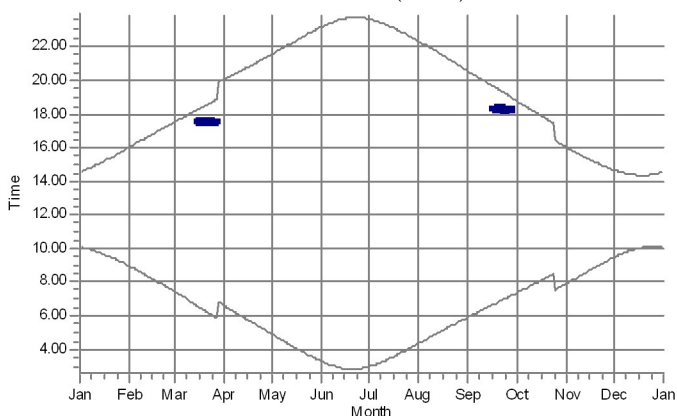
I: Asuinrakenus I (Nuuttila)



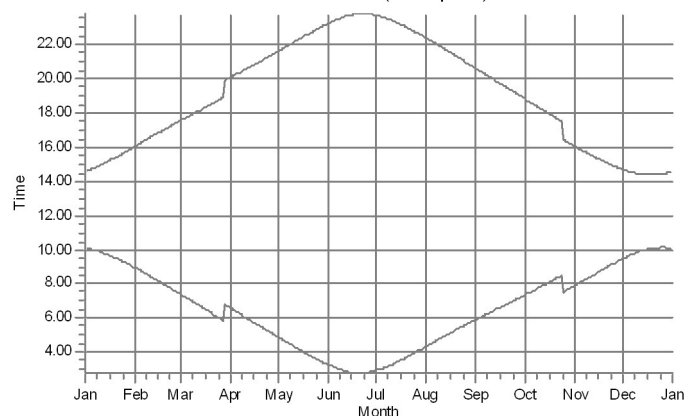
J: Lomarakenus J (Ahmökangas)



K: Asuinrakenus K (Ketola)



L: Asuinrakenus L (Tuohipuro)



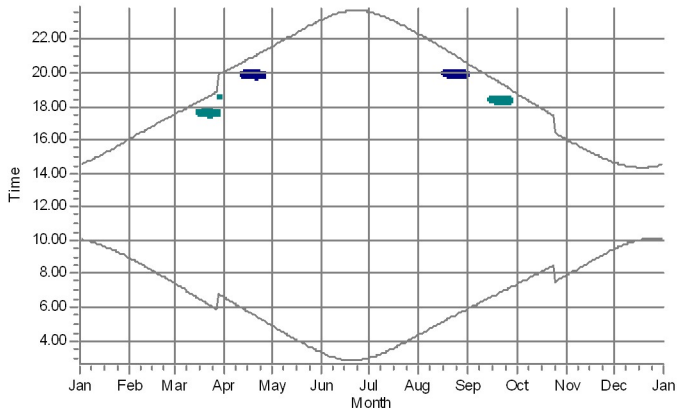
WTGs

7: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (884)	19: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (873)	21: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (898)
18: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (877)	20: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (882)	

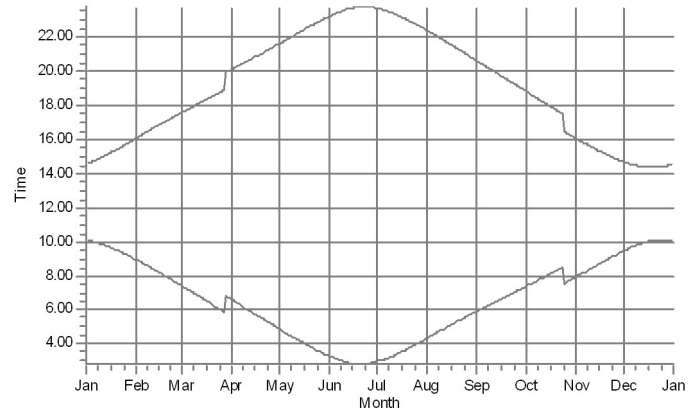
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_No forest

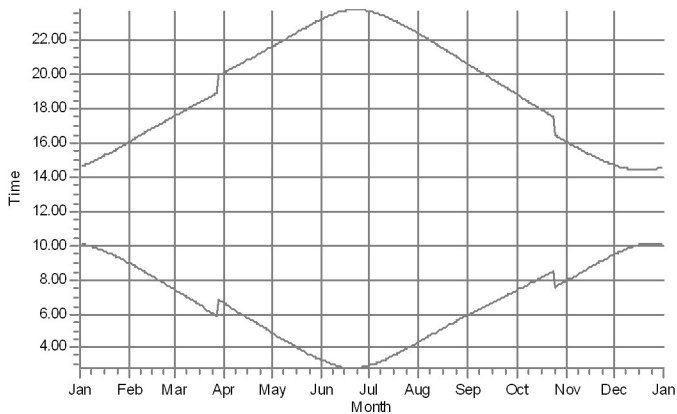
M: Asuinrakennus M (Pilpanperä)



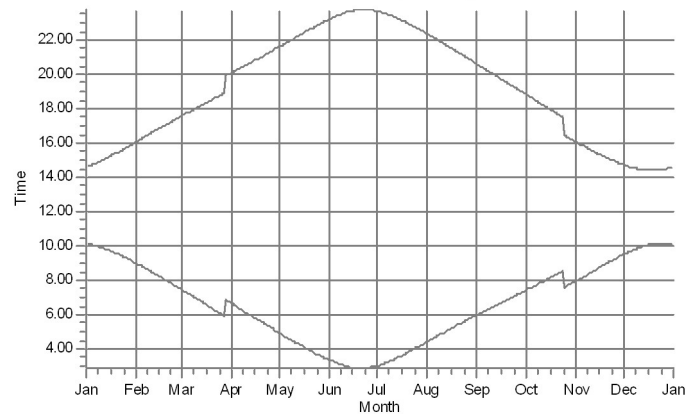
N: Asuinrakennus N (Hanhikaarto)



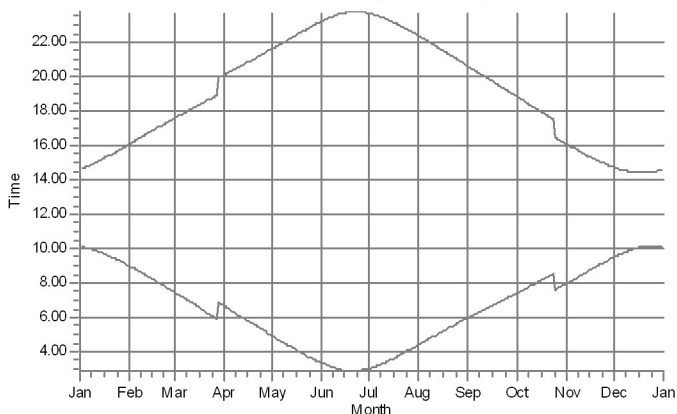
O: Asuinrakennus O (Ketola)



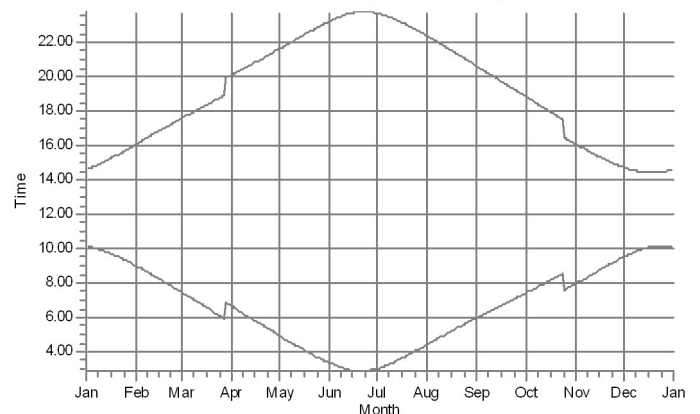
P: Lomarakennus P (Kuistila)



Q: Asuinrakennus Q (Hautalehto)



R: Lomarakennus R (Korpelanperä)



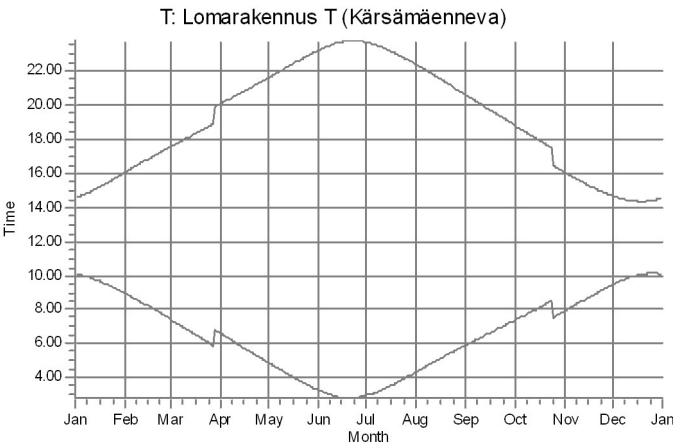
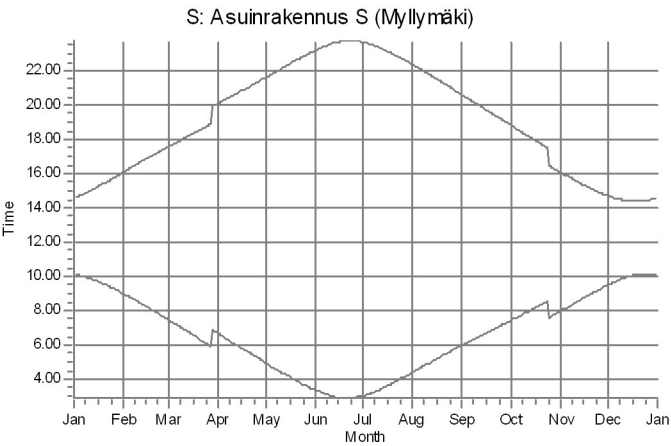
WTGs

6: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (870)

7: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (884)

SHADOW - Calendar, graphical

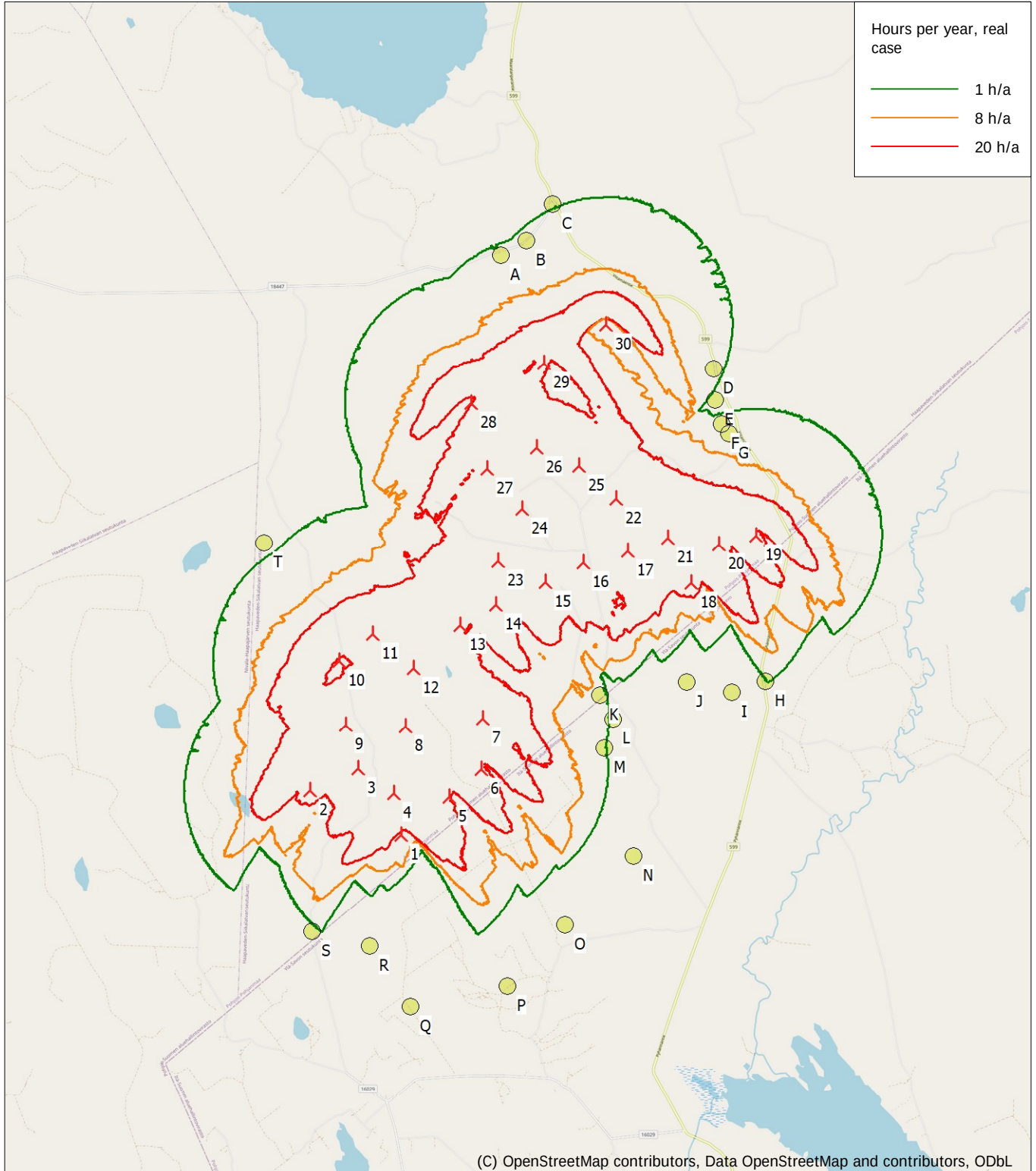
Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_No forest



WTGs

SHADOW - Map

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_No forest



Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 467 860 North: 7 086 900
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Pyh nt _Pilpankangas_0.wpo (1)
 Time step: 3 minutes, Day step: 7 days, Map resolution: 20 m, Visibility resolution: 10 m, Eye height: 1,5 m

6.5.2024

Liite 8. Pilpänkankaan tuulivoimahanke – varjostusmallinnuksen tulokset ”real case, no forest” (VE2).

Project:

Pyhätä_Pilpangkangas

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Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

1.3.2024 16.38/3.6.377

SHADOW - Main Result

Calculation: Pilpangkangas VE2_24xRD200xHH200_202400223_No forest

Assumptions for shadow calculations

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,46	4,19	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational hours are calculated from WTGs in calculation and wind distribution:

MERRA_N64,00_E026,002 (7)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
534	407	418	444	537	869	1 042	1 023	923	826	708	685	8 415

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE_Pyhätä_Pilpangkangas

Receptor grid resolution: 1,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

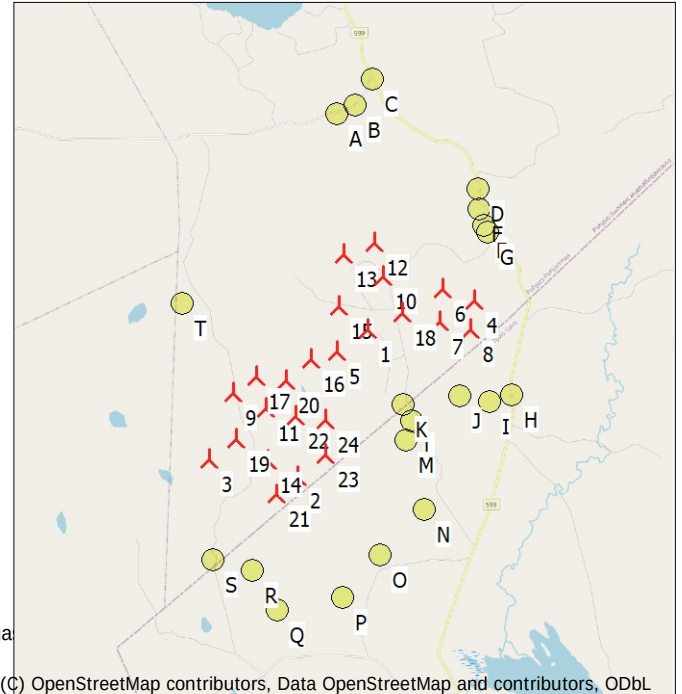
WTGs

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data		
					Valid	Manufact.					Calculation distance [m]	RPM	[RPM]
			[m]										
1	468 261	7 086 867	156,9	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
2	466 361	7 082 992	166,9	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
3	464 036	7 083 492	147,5	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
4	471 111	7 087 617	166,5	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
5	467 461	7 086 317	159,1	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
6	470 261	7 087 917	162,5	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
7	470 186	7 087 042	157,2	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
8	471 011	7 086 842	163,3	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
9	464 686	7 085 217	154,0	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
10	468 686	7 088 267	159,3	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
11	465 536	7 084 792	162,6	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
12	468 449	7 089 139	165,0	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
13	467 636	7 088 842	165,8	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
14	465 586	7 083 442	162,5	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
15	467 511	7 087 492	165,9	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
16	466 761	7 086 117	170,0	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
17	465 286	7 085 667	158,8	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
18	469 186	7 087 292	156,5	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
19	464 736	7 084 017	151,7	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
20	466 111	7 085 542	160,4	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
21	465 786	7 082 517	166,3	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
22	466 336	7 084 592	161,7	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
23	467 111	7 083 592	159,6	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	
24	467 136	7 084 492	159,4	Generic RD200 HH200 7200 2...Yes	Generic		RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4	

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l. [m]	window [°]		(ZVI) a.g.l. [m]
A	Asuinrakennus A (Nurmiaho)	467 539	7 092 595	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Kivikangas)	467 993	7 092 829	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0

To be continued on next page...



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

Scale 1:200 000

New WTG

Shadow receptor

SHADOW - Main Result

Calculation: Pilpankangas VE2_24xRD200xHH200_202400223_No forest

...continued from previous page

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l.	window		(ZVI) a.g.l.
							[m]	[°]		[m]
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Pääkkölä)	471 494	7 089 419	197,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Nuuttila)	471 499	7 084 904	165,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomarakennus J (Ahmokangas)	470 723	7 085 089	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Lomarakennus P (Kuistila)	467 531	7 079 776	162,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Lomarakennus R (Korpelanperä)	465 124	7 080 510	140,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Lomarakennus T (Kärsämäenneva)	463 349	7 087 611	152,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

Shadow, expected values

No.	Name	Shadow hours
		per year
		[h/year]
A	Asuinrakennus A (Nurmiaho)	0:00
B	Asuinrakennus B (Kivikangas)	0:00
C	Asuinrakennus C (Koukkula)	0:00
D	Asuinrakennus D (Konola)	0:00
E	Asuinrakennus E (Piippo)	0:00
F	Asuinrakennus F (Pääkkö)	2:36
G	Lomarakennus G (Pääkkölä)	3:04
H	Asuinrakennus H (Peltola)	0:00
I	Asuinrakennus I (Nuuttila)	0:00
J	Lomarakennus J (Ahmokangas)	0:00
K	Asuinrakennus K (Ketola)	1:41
L	Asuinrakennus L (Tuohipuro)	0:00
M	Asuinrakennus M (Pilpanperä)	3:50
N	Asuinrakennus N (Hanhikaarto)	0:00
O	Asuinrakennus O (Ketola)	0:00
P	Lomarakennus P (Kuistila)	0:00
Q	Asuinrakennus Q (Hautalehto)	0:00
R	Lomarakennus R (Korpelanperä)	0:00
S	Asuinrakennus S (Myllymäki)	0:00
T	Lomarakennus T (Kärsämäenneva)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected
		[h/year]
1	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (552)	0:00
2	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (553)	0:00
3	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (554)	0:00
4	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (555)	2:41
5	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (556)	0:00
6	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (557)	2:34
7	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (558)	0:00
8	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (559)	0:00
9	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (560)	0:00
10	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (561)	0:00
11	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (562)	0:00
12	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (563)	0:00
13	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (564)	0:00

To be continued on next page...

Project:

Pyhäntä_Pilpankangas

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Calculated:

1.3.2024 16.38/3.6.377

SHADOW - Main Result

Calculation: Pilpankangas VE2_24xRD200xHH200_202400223_No forest

...continued from previous page

No.	Name	Expected [h/year]
14	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (565)	0:00
15	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (566)	0:00
16	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (567)	0:00
17	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (568)	0:00
18	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (569)	0:00
19	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (570)	0:00
20	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (571)	0:00
21	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (572)	0:00
22	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (573)	0:00
23	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (574)	1:34
24	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (575)	3:58

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

Project:

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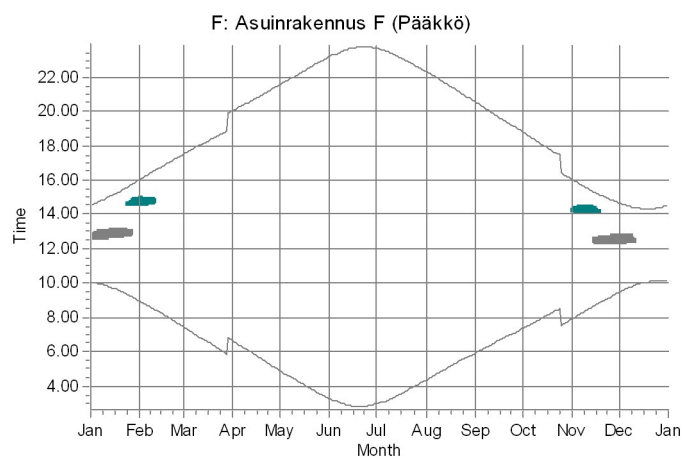
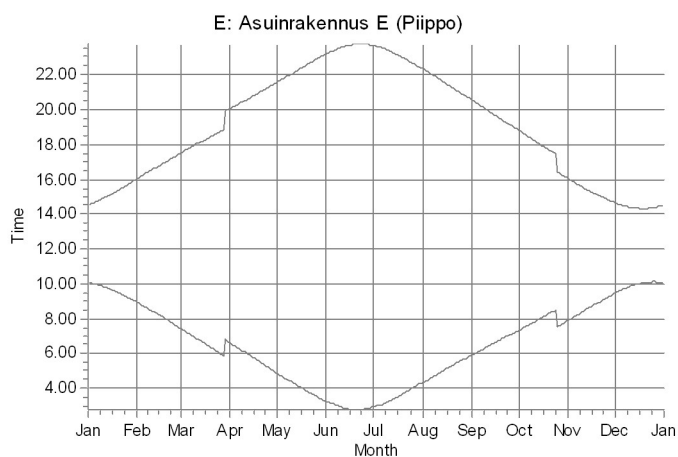
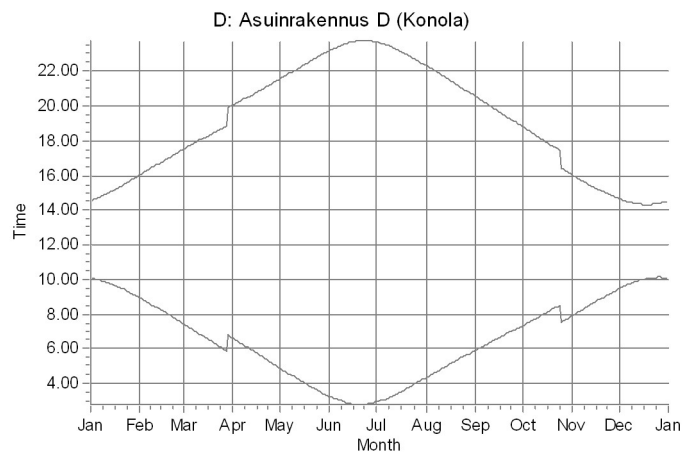
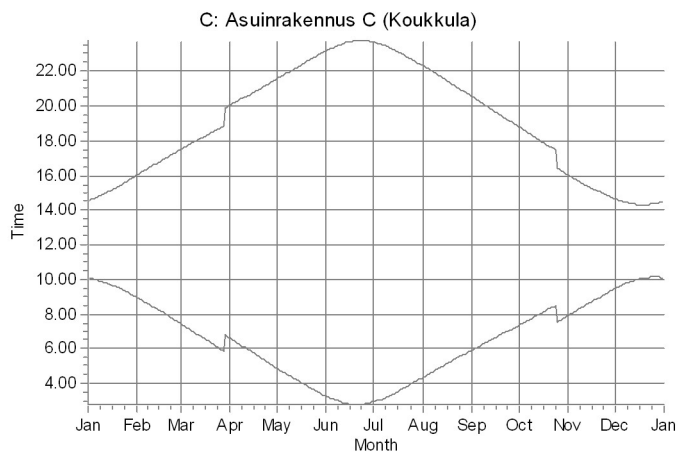
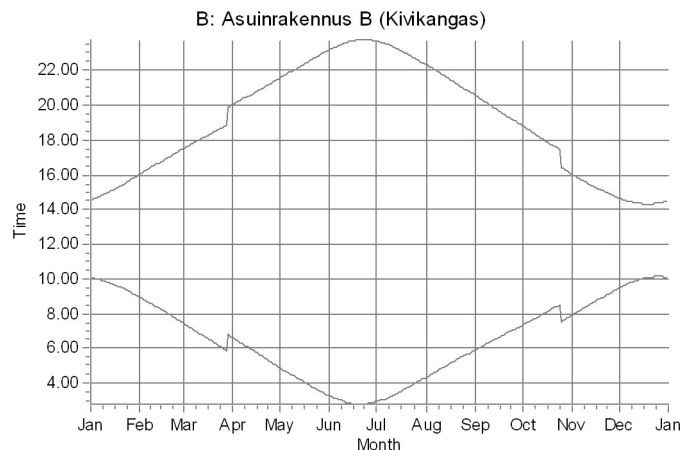
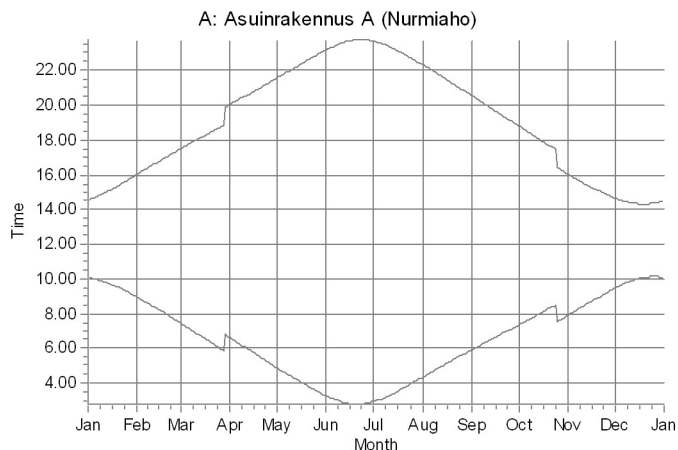
Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

1.3.2024 16.38/3.6.377

SHADOW - Calendar, graphical

Calculation: Pilpankangas VE2_24xRD200xHH200_202400223_No forest



WTGs

4: Generic RD200 HH200 7200 200.0 !0! hub: 200.0 m (TOT: 300.0 m) (555)

6: Generic RD200 HH200 7200 200.0 !0! hub: 200.0 m (TOT: 300.0 m) (557)

Project:

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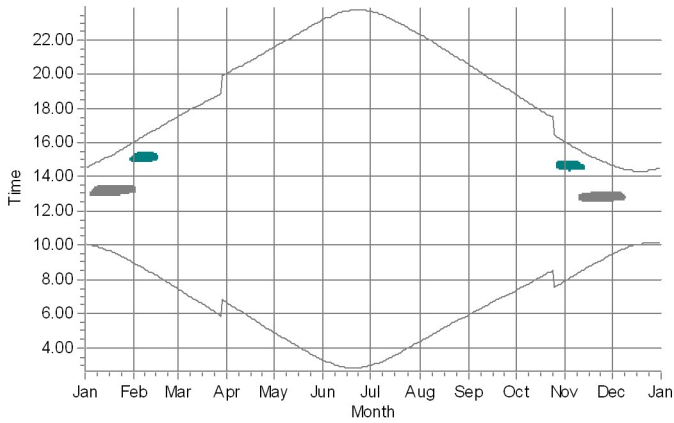
Calculated:

1.3.2024 16.38/3.6.377

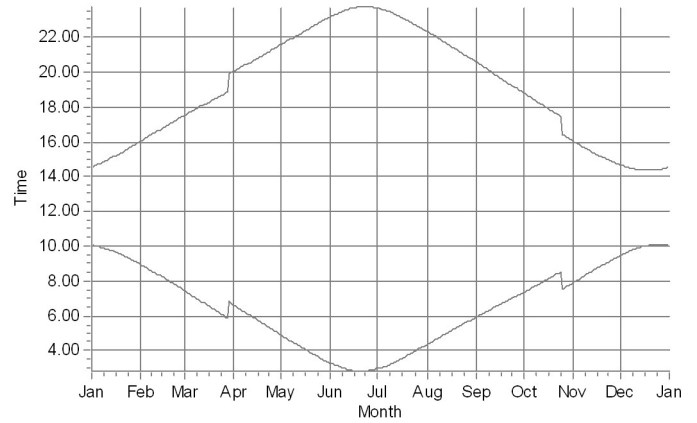
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE2_24xRD200xHH200_202400223_No forest

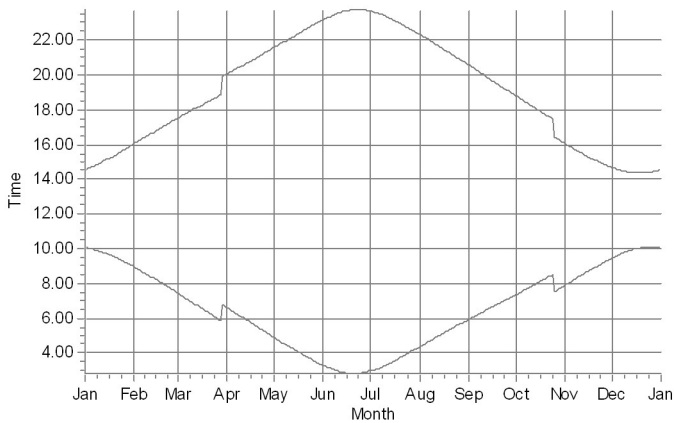
G: Lomarakenus G (Pääkkölä)



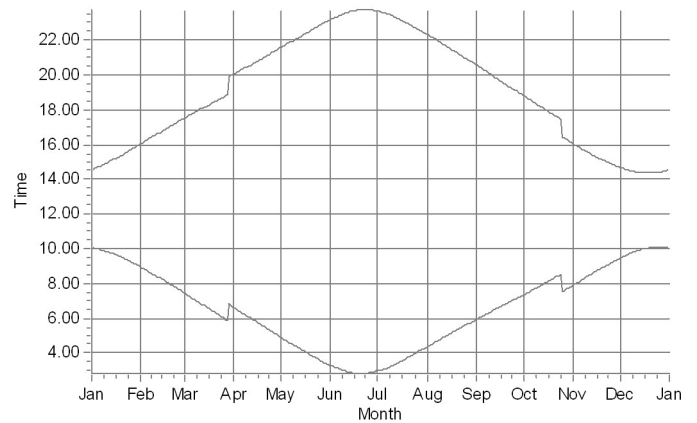
H: Asuinrakenus H (Peltola)



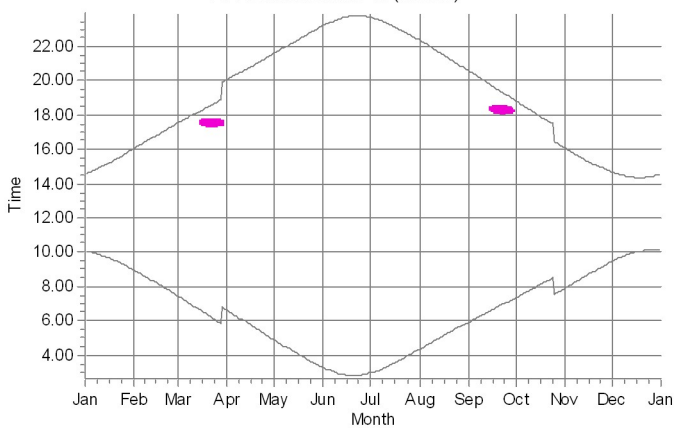
I: Asuinrakenus I (Nuuttila)



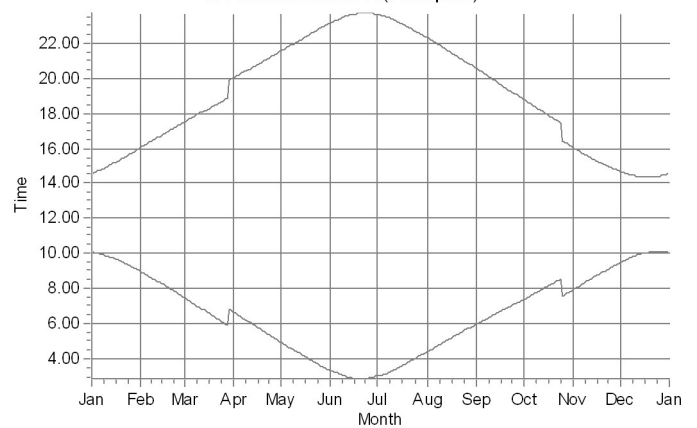
J: Lomarakenus J (Ahmokangas)



K: Asuinrakenus K (Ketola)



L: Asuinrakenus L (Tuohipuro)



WTGs

4: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (555)
6: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (557)

24: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (575)

Project:

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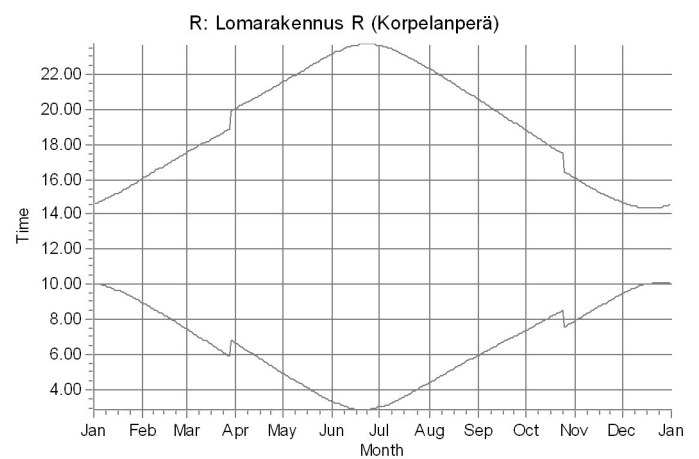
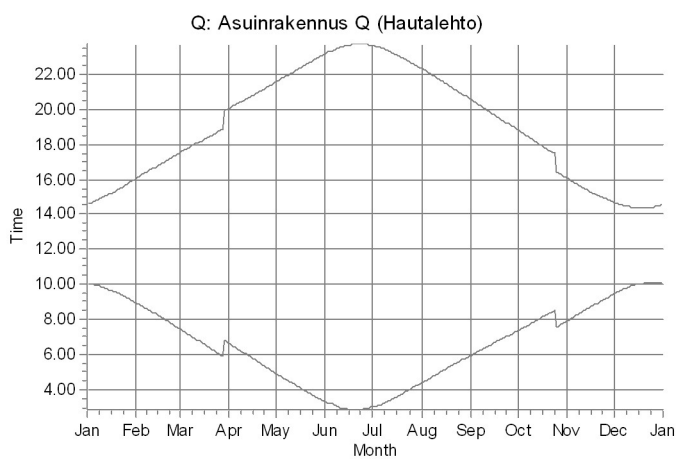
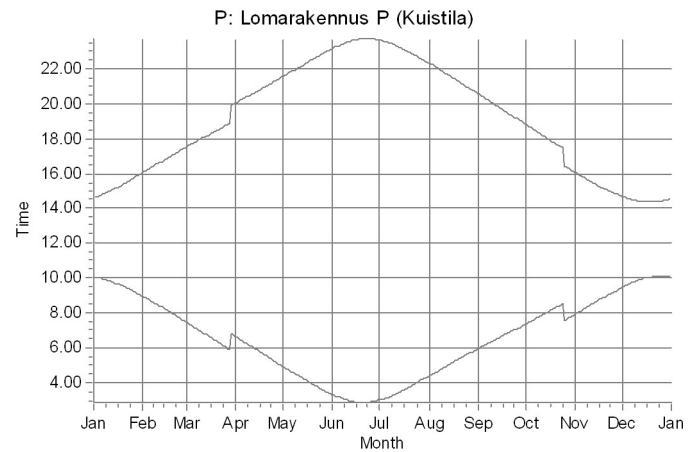
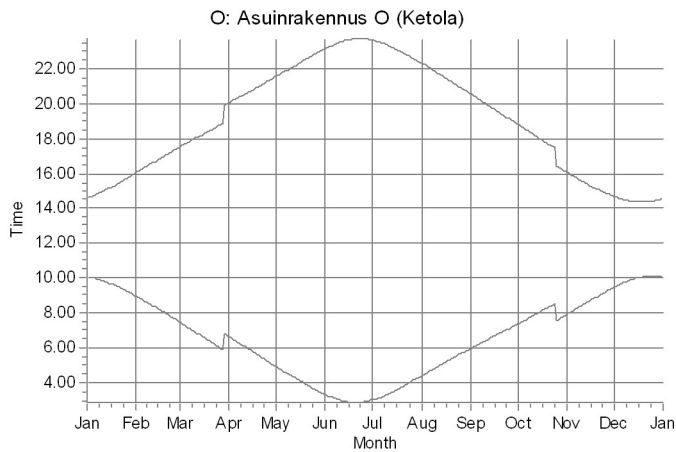
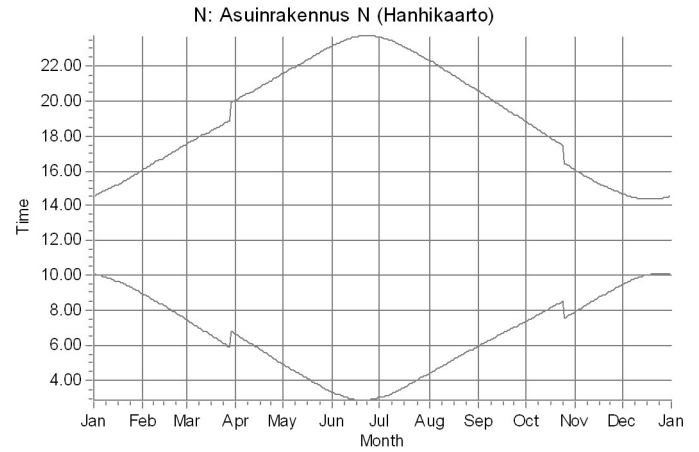
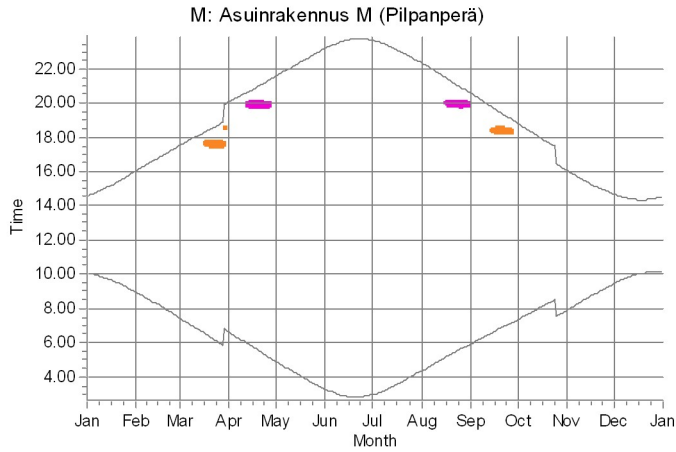
Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

1.3.2024 16.38/3.6.377

SHADOW - Calendar, graphical

Calculation: Pilpankangas VE2_24xRD200xHH200_202400223_No forest



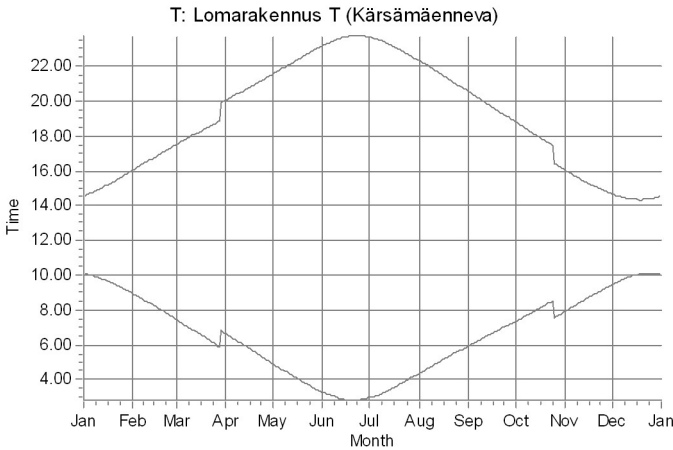
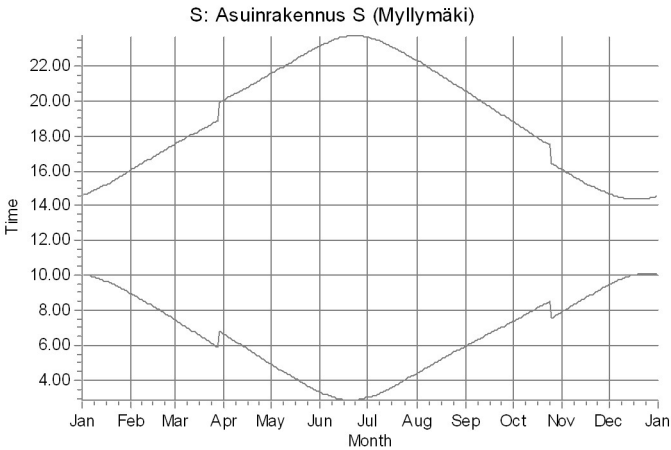
WTGs

23: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (574)

24: Generic RD200 HH200 7200 200.0 IO! hub: 200.0 m (TOT: 300.0 m) (575)

SHADOW - Calendar, graphical

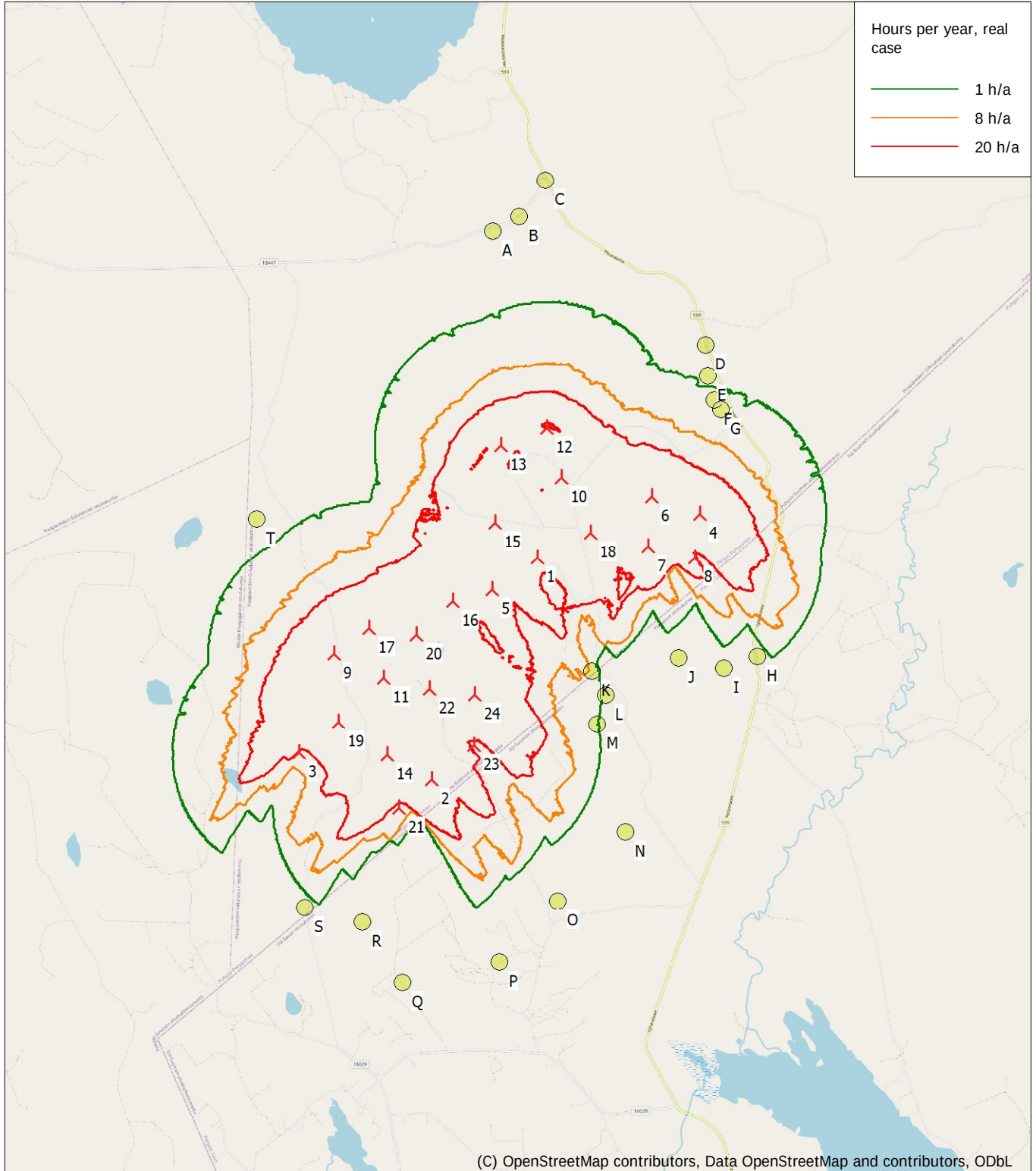
Calculation: Pilpankangas VE2_24xRD200xHH200_202400223_No forest



WTGs

SHADOW - Map

Calculation: Pilpankangas VE2_24xRD200xHH200_202400223_No forest



Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 468 000 North: 7 086 480
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Pyhântä_Pilpankangas_0.wpo (1)
 Time step: 3 minutes, Day step: 7 days, Map resolution: 20 m, Visibility resolution: 10 m, Eye height: 1,5 m

6.5.2024

Liite 9. Pilpankankaan tuulivoimahanke – varjostusmallinnuksen tulokset ”real case, no forest” (VE3).

Project:

Pyhätä_Pilpangkangas

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

1.3.2024 16.52/3.6.377

SHADOW - Main Result

Calculation: Pilpangkangas VE3_14xRD200xHH200_20240223_No forest

Assumptions for shadow calculations

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,46	4,19	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational hours are calculated from WTGs in calculation and wind distribution:

MERRA_N64,00_E026,002 (7)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
534	407	418	444	537	869	1 042	1 023	923	826	708	685	8 415

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE_Pyhätä_Pilpangkangas

Receptor grid resolution: 1,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

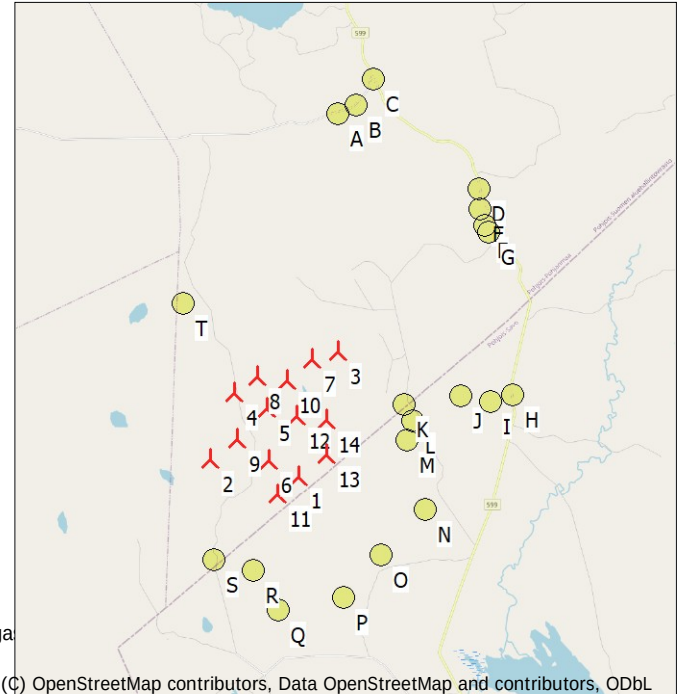
WTGs

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data		
					Valid	Manufact.					Calculation distance [m]	RPM	[RPM]
			[m]										
1	466 361	7 082 992	166,9	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
2	464 036	7 083 492	147,5	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
3	467 461	7 086 317	159,1	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
4	464 686	7 085 217	154,0	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
5	465 536	7 084 792	162,6	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
6	465 586	7 083 442	162,5	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
7	466 761	7 086 117	170,0	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
8	465 286	7 085 667	158,8	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
9	464 736	7 084 017	151,7	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
10	466 111	7 085 542	160,4	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
11	465 786	7 082 517	166,3	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
12	466 336	7 084 592	161,7	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
13	467 111	7 083 592	159,6	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		
14	467 136	7 084 492	159,4	Generic RD200 HH200 7200 2...Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4		

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	a.g.l. [m]	[°]		[m]
A	Asuinrakennus A (Nurmiaho)	467 539	7 092 595	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Kivikangas)	467 993	7 092 829	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakenus G (Pääkkölä)	471 494	7 089 419	197,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Nuuttila)	471 499	7 084 904	165,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomarakenus J (Ahmokangas)	470 723	7 085 089	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

To be continued on next page...



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

Scale 1:200 000

New WTG

Shadow receptor

SHADOW - Main Result

Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_No forest

...continued from previous page

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l.	window		(ZVI) a.g.l.
							[m]	[°]		[m]
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Lomarakennus P (Kuistila)	467 531	7 079 776	162,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Lomarakennus R (Korpelanperä)	465 124	7 080 510	140,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Lomarakennus T (Kärsämäenneva)	463 349	7 087 611	152,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours
		per year
		[h/year]
A	Asuinrakennus A (Nurmiaho)	0:00
B	Asuinrakennus B (Kivikangas)	0:00
C	Asuinrakennus C (Koukkula)	0:00
D	Asuinrakennus D (Konola)	0:00
E	Asuinrakennus E (Piippo)	0:00
F	Asuinrakennus F (Pääkkö)	0:00
G	Lomarakennus G (Pääkkölä)	0:00
H	Asuinrakennus H (Peltola)	0:00
I	Asuinrakennus I (Nuuttila)	0:00
J	Lomarakennus J (Ahmokangas)	0:00
K	Asuinrakennus K (Ketola)	1:41
L	Asuinrakennus L (Tuohipuro)	0:00
M	Asuinrakennus M (Pilpanperä)	3:50
N	Asuinrakennus N (Hanhikaarto)	0:00
O	Asuinrakennus O (Ketola)	0:00
P	Lomarakennus P (Kuistila)	0:00
Q	Asuinrakennus Q (Hautalehto)	0:00
R	Lomarakennus R (Korpelanperä)	0:00
S	Asuinrakennus S (Myllymäki)	0:00
T	Lomarakennus T (Kärsämäenneva)	0:00

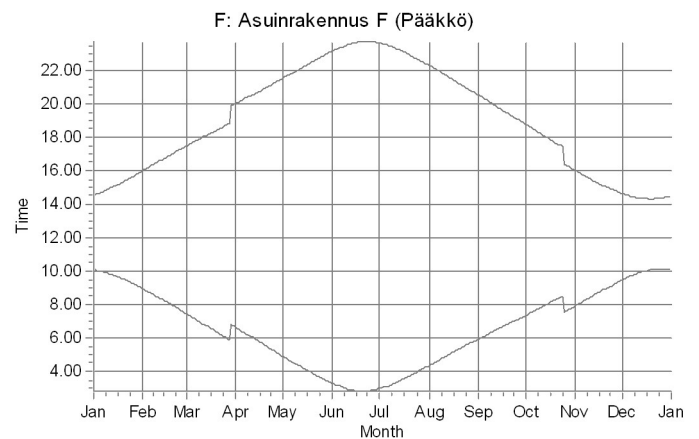
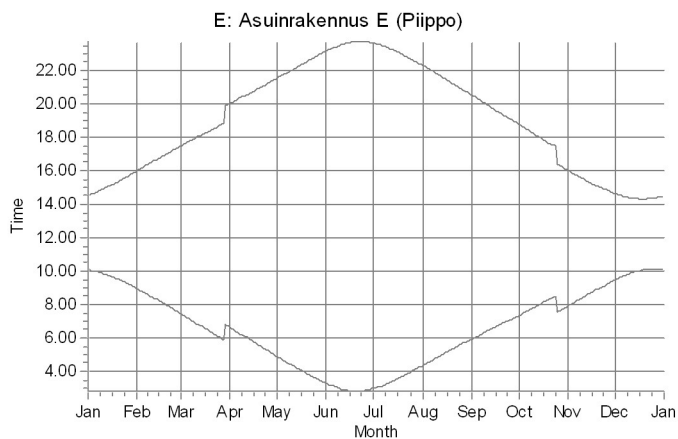
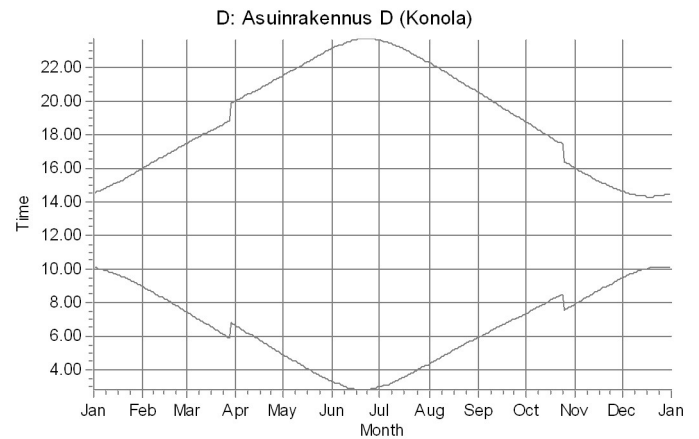
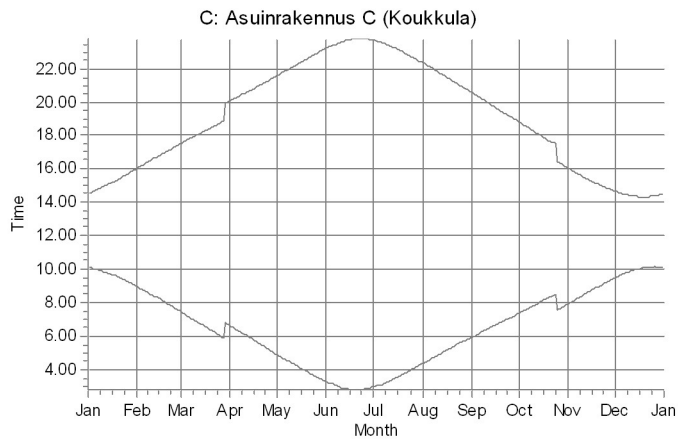
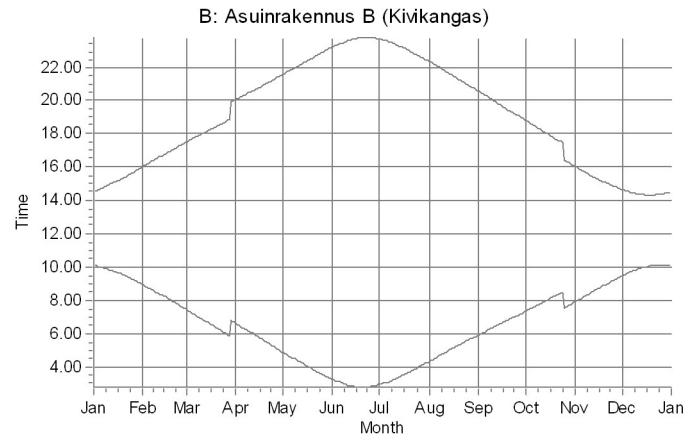
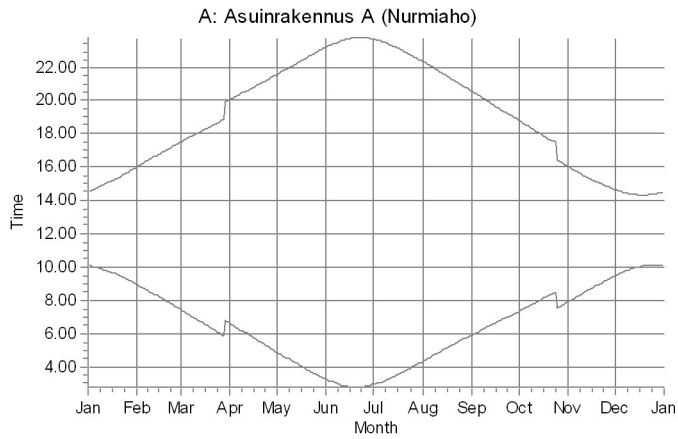
Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected
		[h/year]
1	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (576)	0:00
2	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (577)	0:00
3	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (578)	0:00
4	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (579)	0:00
5	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (580)	0:00
6	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (581)	0:00
7	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (582)	0:00
8	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (583)	0:00
9	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (584)	0:00
10	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (585)	0:00
11	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (586)	0:00
12	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (587)	0:00
13	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (588)	1:34
14	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (589)	3:58

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

SHADOW - Calendar, graphical

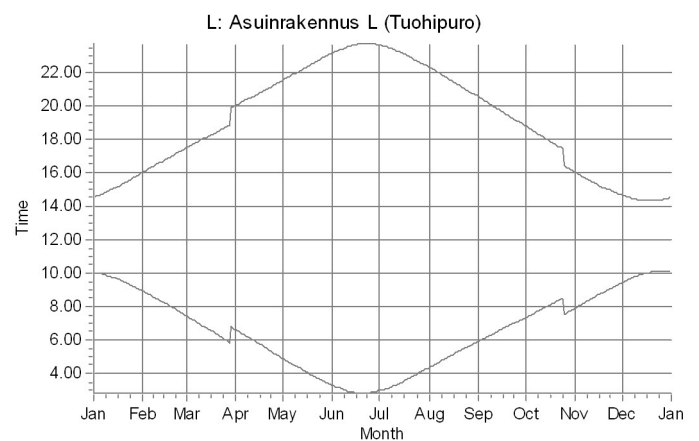
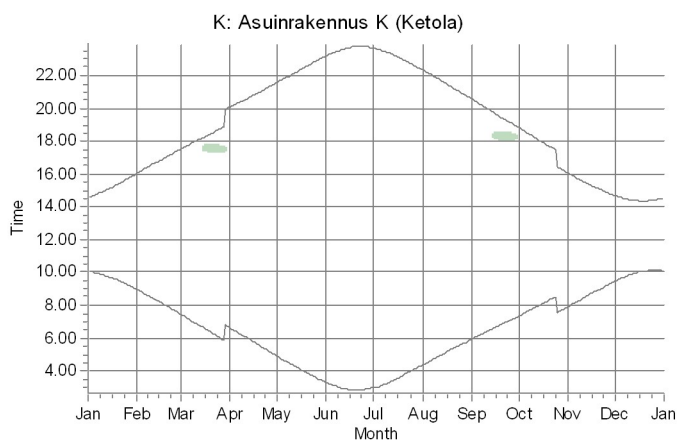
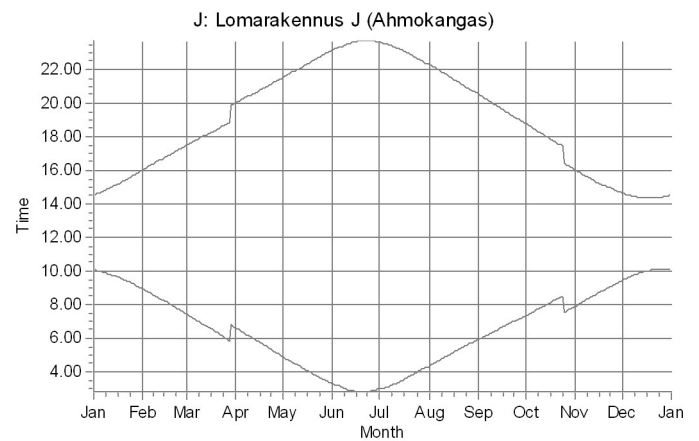
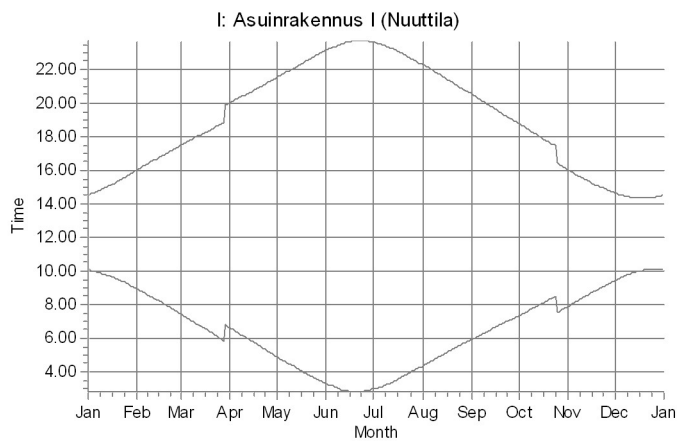
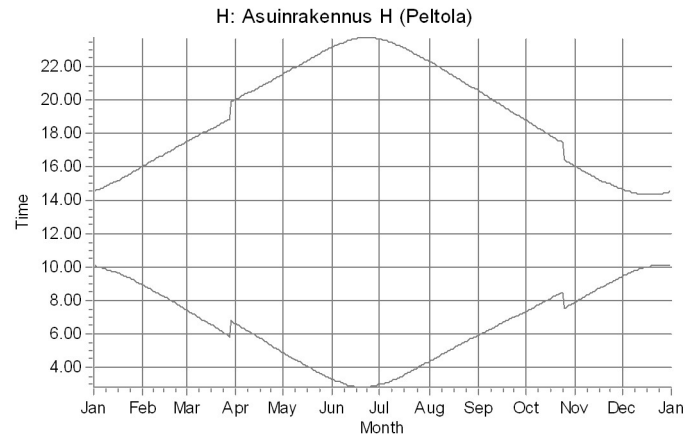
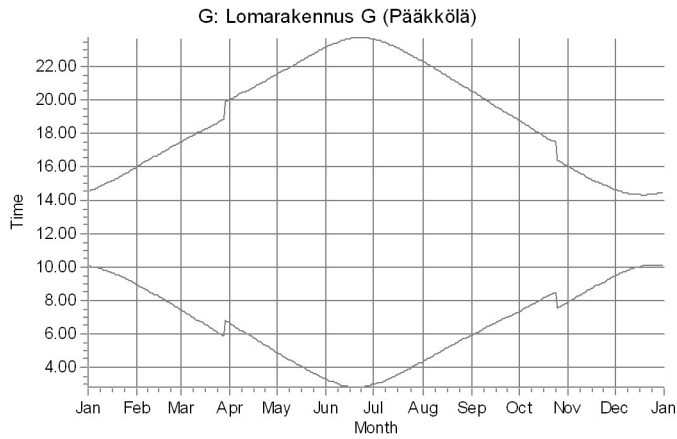
Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_No forest



WTGs

SHADOW - Calendar, graphical

Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_No forest

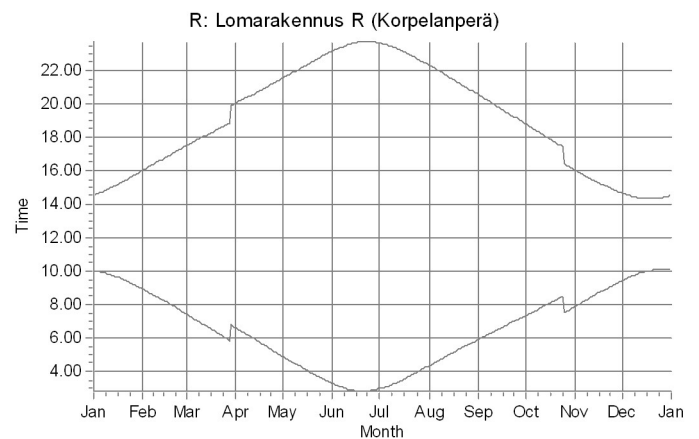
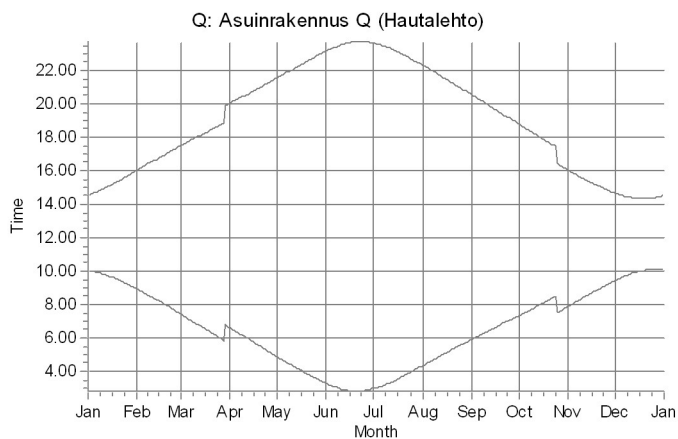
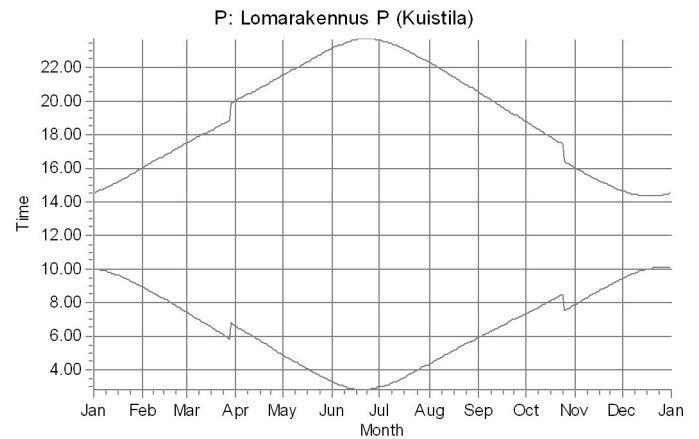
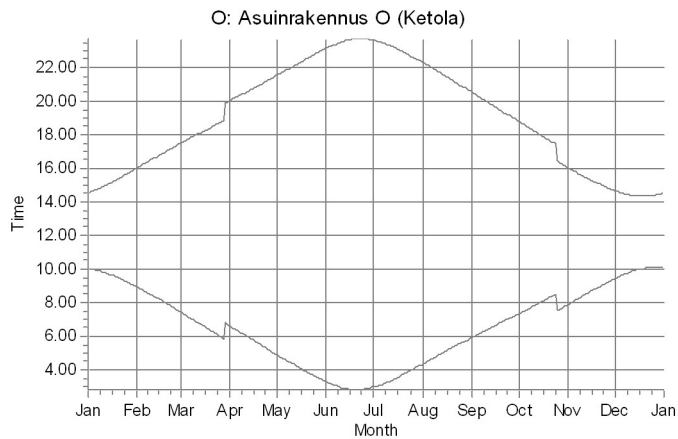
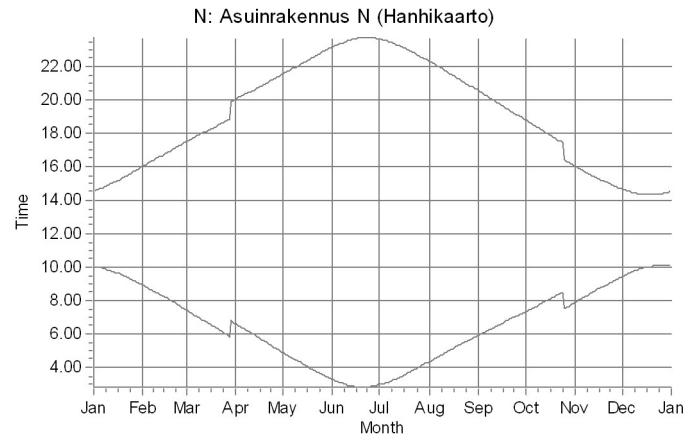
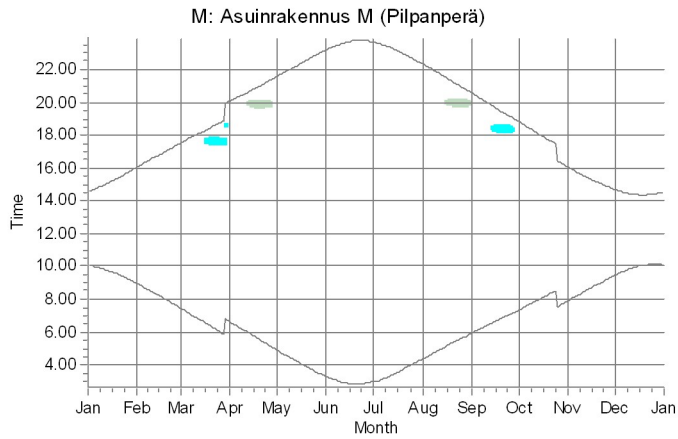


WTGs

14: Generic RD200 HH200 7200 200.0 !OI hub: 200,0 m (TOT: 300,0 m) (589)

SHADOW - Calendar, graphical

Calculation: Pilpangkangas VE3_14xRD200xHH200_20240223_No forest



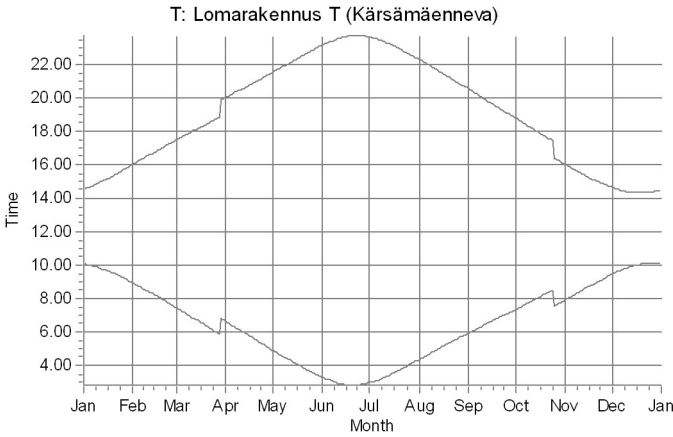
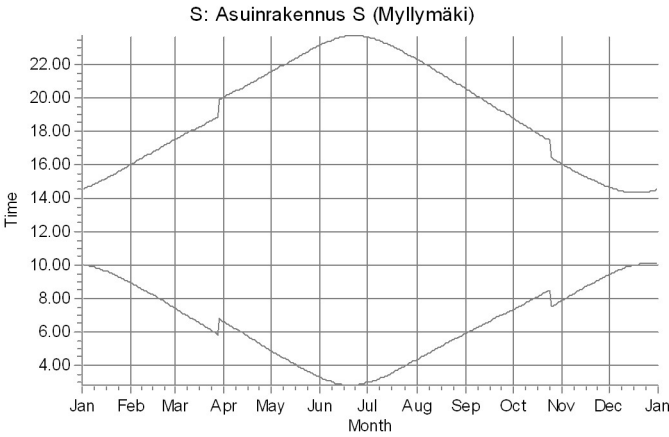
WTGs

13: Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (588)

14: Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (589)

SHADOW - Calendar, graphical

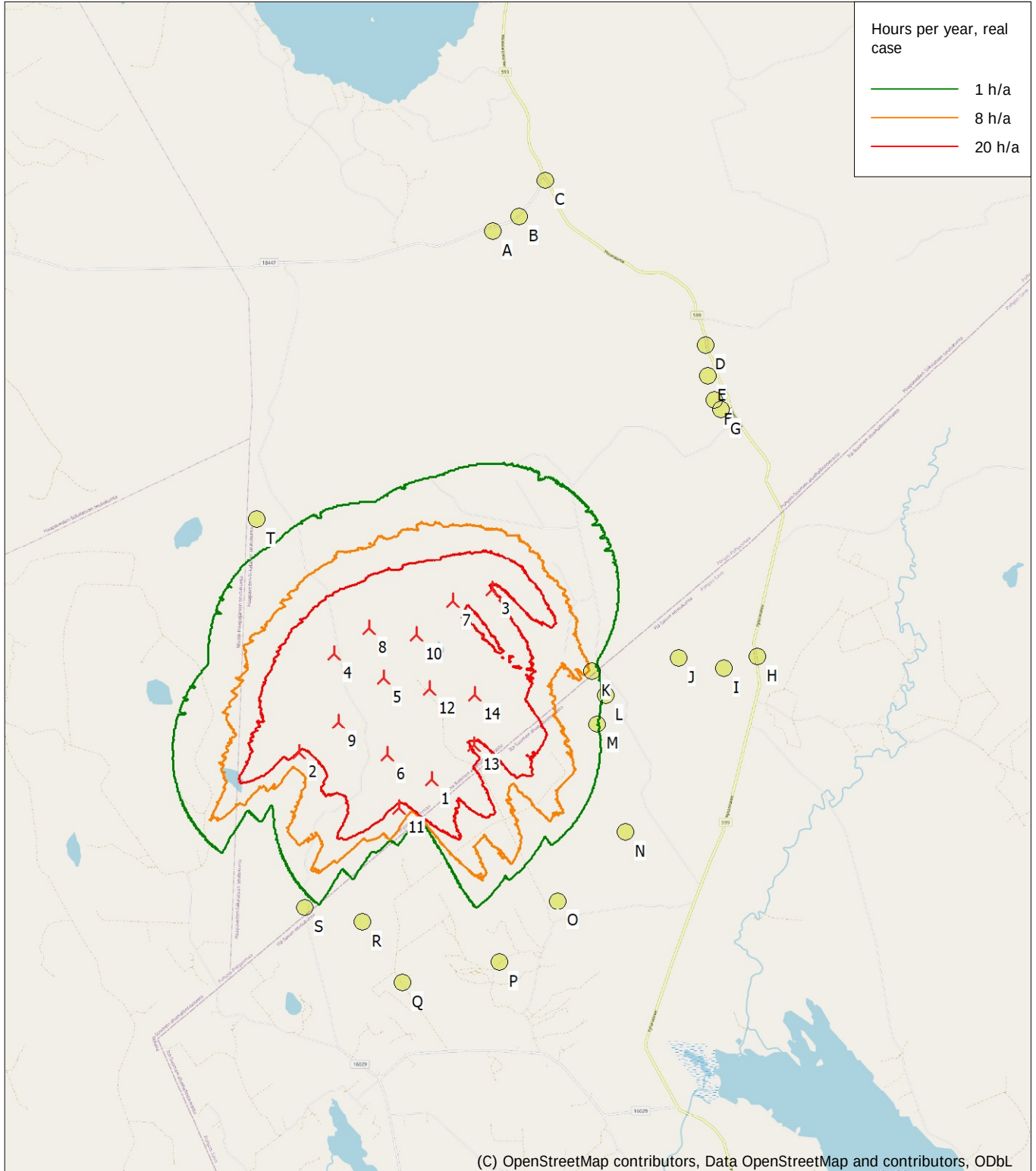
Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_No forest



WTGs

SHADOW - Map

Calculation: Pilpankangas VE3_14xRD200xHH200_20240223_No forest



Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 468 000 North: 7 086 480
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Pyhântä_Pilpankangas_0.wpo (1)
 Time step: 3 minutes, Day step: 7 days, Map resolution: 20 m, Visibility resolution: 10 m, Eye height: 1,5 m

6.5.2024

Liite 10. Melun yhteismallinnuksen tulokset hankevaihtoehdossa 1 (VE1).

Project:

Pyhäntä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Aarni Nikkola / aarni.nikkola@fcg.fi
Calculated:
30.4.2024 11.00/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB_Yhteisvaikutusmallinnus

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhäntä_

Area type with hard ground: Järvet_lammet_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

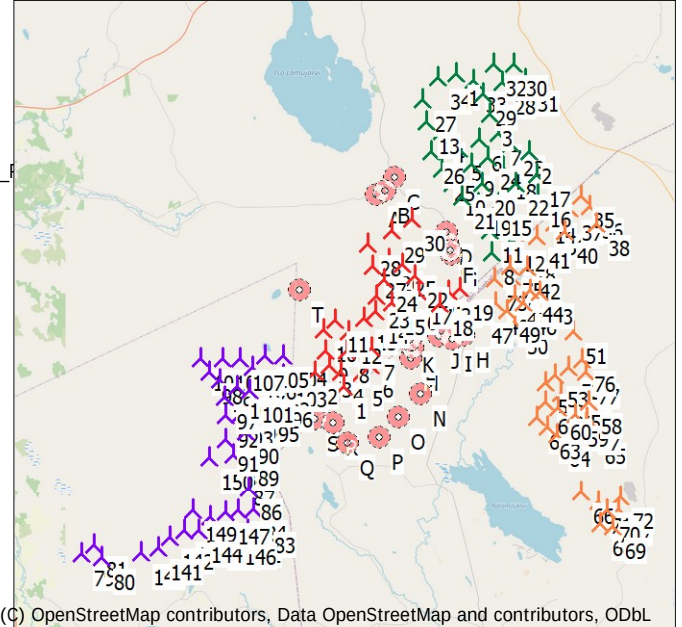
Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more

restrictive, positive is less restrictive.:

0,0 dB(A)



All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

					WTG type					Noise data			
East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Creator	Name	Wind speed [m/s]	LwA,ref [dB(A)]
		[m]											
1	465 686	7 082 467	165,4	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
1	471 839	7 098 977	152,4	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
2	464 106	7 083 255	147,6	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
2	475 592	7 094 825	177,5	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
3	464 951	7 083 636	154,2	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
3	473 530	7 096 766	168,7	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
4	470 952	7 095 933	163,7	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
4	465 561	7 083 192	163,3	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
5	466 536	7 083 117	165,1	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
5	471 895	7 094 973	170,5	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
6	467 111	7 083 592	159,6	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
6	472 999	7 095 500	175,0	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
7	474 026	7 095 796	179,2	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
7	467 136	7 084 492	159,4	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
8	473 642	7 089 459	165,9	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
8	465 786	7 084 367	164,6	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
9	472 556	7 094 191	172,5	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
9	464 736	7 084 392	152,2	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
10	471 545	7 093 189	175,1	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
10	464 636	7 085 517	155,2	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
11	465 236	7 085 992	159,1	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
11	473 523	7 090 697	166,4	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
12	465 936	7 085 367	160,8	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
12	474 724	7 090 192	163,2	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
13	470 207	7 096 391	155,8	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
13	466 761	7 086 117	170,0	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
14	476 298	7 091 642	169,7	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
14	467 386	7 086 467	159,7	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
15	468 261	7 086 867	156,9	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
15	473 955	7 092 082	169,2	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
16	476 097	7 092 538	175,0	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
16	468 936	7 087 192	156,2	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
17	475 979	7 093 646	177,2	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
17	469 711	7 087 392	157,4	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
18	474 232	7 094 014	173,4	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
18	470 821	7 086 831	160,6	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
19	471 948	7 087 636	182,5	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
19	472 921	7 092 121	171,2	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
20	471 311	7 087 492	168,0	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
20	473 133	7 093 196	170,1	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
21	470 411	7 087 617	162,5	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
21	472 045	7 092 434	174,8	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
22	474 928	7 093 153	170,9	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
22	469 511	7 088 317	160,5	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
23	467 436	7 087 242	169,3	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
23	474 653	7 095 212	177,9	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
24	473 928	7 094 501	175,0	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
24	467 861	7 088 142	165,0	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
25	470 952	7 093 929	178,3	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
25	468 861	7 088 892	163,0	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
26	468 133	7 089 218	165,0	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
27	470 430	7 094 892	173,5	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
27	467 261	7 088 867	167,0	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
27	469 994	7 097 616	152,3	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
28	474 257	7 098 465	167,5	Siemens Gamesa SG 6.6-170 660....	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER (AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
28	466 998	7 090 015	168,4	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
29	468 282	7 090 703	164,5	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9

Project:

Pyhäntä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy

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Calculated:

30.4.2024 11.00/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB_Yhteisvaikutusmallinnus

...continued from previous page

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]
					Valid	Manufact.					Creator	Name		
			[m]											
29	473 217	7 097 856	165,0	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
30	469 365	7 091 361	164,5	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
30	474 833	7 099 446	158,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
31	475 413	7 098 667	166,8	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
32	473 764	7 099 462	155,4	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
33	472 690	7 098 642	163,3	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
34	470 814	7 098 750	149,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
35	478 336	7 092 455	177,4	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
36	478 845	7 091 899	190,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
37	477 742	7 091 824	177,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
38	479 177	7 090 979	185,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
39	476 955	7 091 051	172,8	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
40	477 487	7 090 620	182,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
41	475 964	7 090 352	164,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
42	475 501	7 088 705	162,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
43	476 189	7 087 343	162,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
44	475 611	7 087 510	161,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
45	474 845	7 087 199	160,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
46	475 310	7 086 848	160,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
47	472 937	7 086 386	170,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
48	473 780	7 086 830	165,6	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
49	474 399	7 086 459	160,6	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
50	474 825	7 085 835	158,1	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
51	477 918	7 085 282	163,9	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
52	477 610	7 083 418	159,9	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
53	476 957	7 082 967	158,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
54	476 370	7 082 551	156,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
55	477 187	7 082 052	160,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
56	478 121	7 081 754	160,1	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
57	478 641	7 080 668	158,8	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
58	478 709	7 081 538	163,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
59	477 972	7 080 917	155,3	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
60	477 084	7 081 229	157,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
61	476 355	7 081 601	162,8	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
62	475 903	7 080 778	161,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
63	476 526	7 080 222	157,4	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
64	476 972	7 079 815	154,3	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
65	478 868	7 079 944	156,8	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
66	478 217	7 076 798	138,3	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
67	480 292	7 075 796	153,1	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
68	479 248	7 075 045	139,8	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
69	479 889	7 074 867	140,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
70	479 686	7 075 714	147,9	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
71	479 198	7 076 190	147,3	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
72	480 317	7 076 500	159,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
73	473 769	7 088 131	166,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
74	474 672	7 088 183	162,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
75	474 559	7 088 784	163,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
76	478 369	7 083 786	163,1	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
77	478 581	7 083 109	162,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
78	475 224	7 089 562	162,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
79	451 581	7 073 772	158,8	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
80	452 643	7 073 538	167,5	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
81	452 257	7 074 208	165,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
82	460 464	7 074 829	160,9	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
83	461 281	7 075 412	170,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
84	460 757	7 075 976	167,3	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
85	459 969	7 075 947	160,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
86	460 546	7 077 169												

DECIBEL - Main Result

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB_Yhteisvaikutusmallinnus

Sound level

Noise sensitive area

No.	Name	East	North	Z	Immission height	Noise	Sound level	Distance to noise demand
				[m]	[m]	[dB(A)]	From WTGs	[m]
A	Asuinrakennus A (Nurmiaho)	467 539	7 092 595	157,5	4,0	40,0	35,9	963
B	Asuinrakennus B (Kivikangas)	467 993	7 092 829	155,0	4,0	40,0	35,9	972
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	4,0	40,0	35,2	1 338
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	4,0	40,0	38,5	930
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	4,0	40,0	38,9	590
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	4,0	40,0	39,5	220
G	Lomarakennus G (Pääkkölä)	471 494	7 089 419	197,5	4,0	40,0	39,9	56
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	4,0	40,0	38,9	296
I	Asuinrakennus I (Nuutila)	471 499	7 084 904	165,2	4,0	40,0	38,0	641
J	Lomarakennus J (Ahmokaangas)	470 723	7 085 089	155,0	4,0	40,0	38,6	420
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	4,0	40,0	39,1	352
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	4,0	40,0	38,1	810
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	4,0	40,0	37,7	777
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	4,0	40,0	34,4	1 863
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	4,0	40,0	34,2	1 732
P	Lomarakennus P (Kuistila)	467 531	7 079 776	162,3	4,0	40,0	33,3	2 079
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	4,0	40,0	33,9	1 921
R	Lomarakennus R (Korpelanperä)	465 124	7 080 510	140,0	4,0	40,0	36,7	895
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	4,0	40,0	38,0	724
T	Lomarakennus T (Kärsämäenneva)	463 349	7 087 611	152,5	4,0	40,0	36,0	1 147

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	10295	10615	11349	9819	9387	9125	9058	6926	6303	5678	4262	4225	3870	4087	3282	3263	3030	2037	2313	5650
2	7696	7252	6460	8428	8978	9390	9565	13879	14077	13933	14345	14736	15254	17049	18423	19679	20446	19650	19773	14187
3	9951	10332	11106	10213	9847	9651	9621	8197	7575	6866	5349	5448	5204	5773	5046	4882	4178	2928	2476	4422
4	8356	7857	7262	6092	6469	6713	6784	10336	10732	10886	11824	12079	12589	14041	15652	17072	18232	17734	18145	14210
5	9325	9683	10443	9356	8976	8768	8732	7289	6670	5951	4429	4543	4324	5055	4544	4643	4283	3131	2980	4286
6	7300	6795	6048	6608	7119	7484	7624	11754	12034	12010	12653	12992	13515	15187	16678	18018	18968	18301	18558	13692
7	4774	4289	3504	5370	5924	6350	6537	10893	11042	10847	11195	11594	12110	13929	15273	16515	17276	16488	16629	11272
8	9608	9938	10681	9305	8894	8654	8600	6804	6180	5499	4012	4058	3778	4343	3791	3944	3761	2718	2819	4942
9	9530	9820	10532	8809	8364	8091	8017	5899	5275	4627	3194	3175	2850	3387	3027	3487	3749	2966	3373	5510
10	4963	4453	3751	4452	4995	5400	5569	9875	10076	9954	10450	10819	11341	13094	14515	15811	16683	15970	16191	11280
11	9012	9278	9972	8104	7650	7368	7290	5204	4580	3909	2454	2462	2181	3056	3093	3840	4352	3668	4117	5505
12	6185	5675	4974	5237	5750	6120	6265	10440	10701	10657	11282	11624	12147	13831	15312	16648	17596	16933	17199	12464
13	7234	6724	6034	5926	6405	6739	6862	10870	11181	11205	11938	12253	12775	14389	15919	17287	18304	17689	17998	13453
14	8112	8380	9077	7329	6897	6639	6577	4993	4382	3636	2102	2287	2198	3575	3904	4733	5224	4462	4793	4906
15	6862	6578	6558	2654	2443	2266	2149	4626	5033	5256	6380	6557	7043	8363	10005	11450	12717	12355	12895	10458
16	8412	8744	9489	8254	7870	7658	7622	6348	5738	4989	3454	3637	3504	4451	4468	4912	4928	3914	3963	4058
17	5265	4763	4162	3855	4369	4741	4889	9103	9346	9285	9900	10242	10765	12455	13931	15266	16221	15570	15852	11317
18	8668	9043	9813	8964	8617	8440	8422	7390	6782	6027	4493	4687	4550	5534	5199	5397	5068	3902	3668	3505
19	4050	3571	3101	2637	3184	3595	3771	8108	8285	8142	8637	9003	9525	11277	12698	14001	14898	14212	14469	9914
20	7649	8045	8825	8309	8011	7882	7889	7468	6890	6102	4612	4906	4889	6177	6086	6430	6190	5031	4768	2458
21	6992	7371	8144	7544	7248	7124	7134	6914	6357	5560	4121	4465	4520	5991	6113	6627	6578	5484	5335	2487
22	6278	5927	5777	2295	2359	2408	2398	5777	6136	6268	7249	7481	7986	9428	11034	12457	13646	13203	13677	10632
23	7403	7739	8488	7424	7072	6894	6877	6162	5582	4795	3304	3608	3621	5053	5214	5815	5929	4925	4940	3425
24	7576	7229	7074	3513	3464	3396	3322	5732	6193	6485	7664	7822	8299	9535	11201	12659	13967	13635	14190	11664
25	4640	4195	3403	5910	6460	6894	7090	11447	11559	11314	11559	11977	12485	14342	15629	16829	17512	16675	16762	11141
26	6524	6823	7549	6310	5957	5783	5770	5427	4891	4093	2739	3146	3317	5044	5560	6388	6745	5842	5963	3725
27	8811	8390	8052	5178	5290	5326	5294	7777	8272	8604	9804	9957	10429	11608	13289	14754	16090	15773	16330	13562
28	6129	6390	7087	5623	5257	5075	5058	4901	4400	3610	2415	2874	3148	5006	5734	6693	7202	6373	6567	4197
29	5773	5967	6609	4747	4352	4145	4118	4219	3786	3037	2203	2691	3093	5038	6023	7129	7822	7090	7372	4969
30	6437	6009	5672	3114	3392	3578	3627	7226	7586	7704	8632	8885	9395	10871	12467	13882	15039	14557	14992	11510
31	8559	8110	7697	5248	5451	5558	5561	8448	8911	9186	10307	10494	10981	12253	13916	15371	16655	16282	16795	13667
32	5580	5715	6299	4084	3661	3429	3391	3787	3436	2760	2332	2795	3267	5201	6354	7549	8359	7694	8029	5603
33	8506	8028	7524	5656	5949	6127	6164	9388	9823	10043	11083	11302	11801	13157	14799	16241	17471	17041	17508	13998
34	5638	5701	6209	3523	3050	2766	2699	3305	3064	2516	2567	2966	3480	5337	6645	7923	8858	8271	8670	6366
35	6842	6351	5801	4567	4978	5257	5349	9167	9511	9590	10430	10714	11231	12770	14340	15736	16833	16289	16665	12627
36	6633	6631	7050	3762	3217	2823	2674	2148	2043	1745	2538	2770	3282	4893	6400	7785	8930	8510	9040	7513
37	6635	6527	6801	3020	2478	2042	1839	2540	2768	2827	3892	4073	4566	5997	7592	9016	10240	9867	10417	8599
38	5403	4979	4665	2293	2678	2956	3056	7070	7355	7368	8143	8440	8960	10552	12091	13471	14539	13986	14365	10581
39	6346	6284	6627	3079	2526	2106	1935	2517	2595	2475	3360	3589	4099	5656	7196	8593	9753	9330	9848	7964
40	5627	5154	4685	3241	3687	4002	4118	8163	8451	8458	9202	9509	10031	11642	13171	14543	15584	15003	15352	11266
41	5747	5745	6173	3065	2547	2205	2101	3027	2923	2548	2996	3328	3851	5601	7020	8354	9384	8859	9302	7063
42	4509	4072	3736	2033	2539	2913	3065	7334	7549	7463	8075	8413	8936	10628	12101	13439	14413	13787	14102	9944

To be continued on next page...

Project:

Pyhäntä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy

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Calculated:

30.4.2024 11.00/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB_Yhteisvaikutusmallinnus

...continued from previous page

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
22	7410	6943	6479	4509	4822	5022	5073	8538	8933	9095	10064	10306	10813	12245	13861	15286	16468	15999	16439	12837
22	4710	4760	5262	2835	2442	2266	2268	4125	3950	3449	3455	3878	4383	6266	7529	8768	9619	8956	9276	6203
23	5353	5614	6314	5048	4728	4594	4604	5125	4688	3929	2953	3435	3773	5680	6487	7467	7970	7119	7271	4104
23	7580	7074	6436	5766	6202	6498	6599	10431	10779	10859	11685	11974	12492	14039	15607	17000	18082	17520	17876	13622
24	6211	5708	5098	4513	4988	5322	5446	9499	9793	9799	10520	10837	11359	12983	14505	15870	16888	16281	16602	12227
24	4464	4688	5364	4154	3885	3808	3850	5211	4870	4185	3531	4018	4429	6374	7323	8373	8941	8109	8266	4544
25	3665	3157	2537	3370	3924	4352	4543	8902	9041	8843	9220	9611	10129	11934	13298	14561	15375	14630	14826	9886
25	3932	4031	4599	2904	2653	2616	2684	4982	4782	4235	4031	4488	4967	6895	8048	9213	9933	9178	9405	5660
26	3429	3614	4268	3382	3232	3270	3367	5713	5471	4874	4472	4949	5396	7343	8377	9461	10050	9213	9350	5046
26	3693	3194	2430	4395	4945	5379	5576	9932	10045	9808	10091	10500	11012	12854	14167	15392	16128	15330	15465	10156
27	3738	4028	4758	4320	4165	4183	4268	6126	5802	5124	4439	4927	5318	7253	8118	9096	9539	8627	8682	4109
27	5589	5189	4419	7153	7704	8137	8333	12691	12800	12548	12765	13188	13694	15562	16828	18009	18652	17786	17837	12011
28	8922	8427	7653	8454	8962	9322	9459	13539	13838	13835	14498	14835	15358	17016	18518	19863	20816	20145	20392	15388
28	2636	2984	3753	4270	4266	4402	4535	7078	6810	6175	5592	6079	6482	8422	9293	10253	10642	9688	9678	4370
29	2032	2145	2775	2953	3060	3290	3459	6776	6631	6122	5900	6366	6833	8772	9856	10953	11532	10671	10767	5822
29	7741	7251	6471	7551	8078	8460	8611	12806	13065	13009	13587	13942	14465	16176	17636	18953	19850	19141	19356	14225
30	2204	2009	2299	2027	2326	2678	2881	6829	6800	6418	6487	6921	7420	9313	10542	11730	12440	11651	11817	7089
30	10007	9517	8737	9578	10081	10436	10569	14606	14919	14934	15620	15951	16474	18117	19630	20982	21947	21280	21530	16491
31	9944	9442	8681	9112	9593	9925	10045	13968	14308	14365	15125	15436	15958	17549	19095	20470	21492	20870	21162	16364
32	9269	8793	8002	9245	9770	10148	10297	14459	14733	14691	15283	15637	16160	17862	19330	20649	21544	20829	21032	15777
33	7944	7474	6681	8202	8741	9139	9301	13555	13789	13695	14201	14573	15094	16844	18268	19559	20398	19647	19819	14455
34	6972	6559	5779	8190	8744	9170	9356	13710	13862	13662	13967	14377	14889	16728	18043	19256	19948	19107	19182	13409
35	10798	10350	9932	7350	7480	7520	7486	9648	10186	10594	11868	11987	12441	13484	15185	16659	18064	17812	18407	15751
36	11328	10892	10507	7728	7811	7811	7759	9583	10143	10600	11928	12017	12454	13400	15106	16583	18032	17832	18463	16079
37	10232	9801	9431	6630	6725	6740	6695	8783	9319	9728	11009	11123	11576	12619	14319	15793	17197	16948	17548	14997
38	11750	11336	11007	7956	7971	7918	7840	9206	9790	10304	11693	11743	12157	12979	14686	16160	17659	17524	18198	16183
39	9542	9137	8837	5743	5784	5761	5700	7685	8219	8625	9911	10022	10473	11523	13222	14695	16095	15846	16450	14034
40	10143	9748	9471	6256	6252	6192	6113	7719	8278	8738	10081	10160	10593	11540	13246	14722	16167	15971	16611	14455
41	8719	8347	8130	4737	4712	4645	4567	6525	7043	7428	8700	8817	9272	10364	12056	13527	14906	14642	15240	12909
42	8862	8566	8506	4659	4436	4216	4071	4962	5519	5992	7371	7425	7848	8790	10493	11969	13408	13223	13881	12201
43	10120	9863	9867	5915	5604	5311	5134	4671	5286	5913	7409	7363	7715	8330	10031	11499	13046	13005	13751	12843
44	9540	9291	9314	5343	5018	4718	4538	4265	4868	5455	6928	6908	7281	8004	9711	11185	12696	12609	13330	12263
45	9083	8868	8954	4942	4557	4214	4020	3462	4057	4631	6101	6084	6462	7238	8945	10421	11910	11800	12512	11504
46	9665	9451	9532	5522	5140	4796	4602	3662	4278	4913	6418	6361	6708	7339	9043	10514	12048	11998	12743	11986
47	8228	8122	8385	4519	3999	3570	3359	1539	2064	2566	4028	4017	4412	5375	7067	8539	9952	9776	10461	9667
48	8496	8335	8512	4526	4060	3663	3454	2417	2985	3518	4977	4970	5361	6246	7949	9424	10870	10718	11411	10460
49	9204	9034	9193	5190	4742	4354	4147	2677	3290	3923	5431	5370	5718	6401	8109	9583	11093	11019	11756	11110
50	9939	9777	9944	5944	5493	5101	4893	2830	3453	4169	5703	5579	5874	6325	8019	9482	11053	11067	11852	11613
51	12697	12469	12515	8525	8167	7834	7641	5829	6430	7198	8724	8537	8757	8779	10370	11756	13444	13655	14527	14754
52	13625	13455	13597	9583	9155	8774	8568	5768	6289	7087	8532	8250	8362	7974	9424	10717	12453	12820	13759	14865
53	13468	13327	13514	9518	9062	8664	8454	5311	5791	6585	7985	7676	7754	7261	8676	9951	11692	12085	13036	14379
54	13374	13259	13487	9524	9045	8634	8423	4980	5410	6192	7535	7200	7241	6636	8011	9265	11010	11431	12392	13970
55	14291	14166	14376	10394	9926	9521	9310	5937	6363	7142	8469	8123	8145	7434	8728	9921	11673	12162	13143	14913
56	15142	15000	15182	11181	10730	10335	10125	6890	7329	8111	9445	9100	9121	8373	9622	10775	12529	13058	14050	15888
57	16295	16164	16361	12368	11909	11509	11299	7907	8304	9069	10333	9960	9932	8996	10100	11146	12890	13518	14535	16795
58	15717	15567	15734	11726	11284	10893	10685	7514	7957	8740	10075	9729	9745	8971	10189	11316	13068	13624	14622	16517
59	15660	15539	15754	11774	11306	10900	10689	7216	7602	8364	9621	9247	9218	8298	9430	10503	12252	12855	13867	16083
60	14842	14738	14978	11023	10541	10128	9916	6317	6686	7441	8684	8307	8277	7378	8550	9663	11416	11982	12986	15146
61	14092	14000	14259	10330	9836	9418	9206	5515	5873	6625	7866	7491	7467	6618	7848	9011	10764	11284	12276	14328
62	14478	14415	14718	10850	10339	9912	9701	5762	6035	6739	7854	7443	7354	6282	7361	8432	10182	10783	11797	14294
63	15293	15223	15515	11624	11120	10695	10484	6592	6870	7574	8677	8261	8159	7017	8008	9006	10745	11406	12432	15108
64	15884	15811	16095	12192	11691	11268														

DECIBEL - Main Result

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB_Yhteisvaikutusmallinnus

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
84	17949	18340	19116	17964	17537	17274	17204	14551	13968	13504	12270	12113	11654	10857	9185	7767	6126	6295	5855	11921
85	18288	18691	19473	18458	18043	17792	17729	15190	14601	14114	12845	12709	12260	11534	9877	8476	6805	6884	6361	12144
86	16937	17340	18122	17140	16732	16488	16429	14008	13409	12895	11591	11475	11040	10423	8803	7455	5732	5667	5070	10812
87	16435	16851	17637	16824	16433	16207	16158	13940	13332	12780	11423	11342	10930	10461	8895	7616	5866	5613	4887	10210
88	15758	16188	16979	16375	16008	15805	15768	13814	13196	12600	11186	11149	10769	10490	9007	7831	6084	5611	4745	9429
89	15386	15806	16594	15863	15484	15270	15228	13177	12562	11978	10581	10530	10140	9817	8322	7138	5391	4937	4098	9143
90	14360	14790	15581	15027	14671	14478	14448	12672	12050	11421	9972	9969	9617	9510	8132	7095	5407	4697	3723	8044
91	15232	15675	16469	16068	15726	15545	15520	13816	13194	12560	11104	11108	10761	10651	9254	8177	6463	5820	4862	8819
92	14150	14604	15399	15210	14895	14740	14729	13341	12716	12040	10542	10599	10297	10415	9156	8239	6615	5759	4725	7683
93	13709	14153	14947	14617	14288	14121	14105	12623	11999	11330	9840	9886	9575	9670	8411	7507	5902	5020	3982	7299
94	13127	13562	14355	13922	13585	13411	13391	11874	11250	10581	9093	9137	8826	8943	7715	6863	5307	4356	3307	6787
95	12782	13204	13994	13401	13048	12860	12833	11201	10577	9920	8443	8471	8149	8232	7002	6167	4643	3655	2604	6561
96	11845	12262	13050	12441	12092	11909	11884	10370	9746	9067	7572	7627	7331	7565	6462	5798	4451	3304	2289	5704
97	13423	13887	14681	14691	14402	14271	14273	13160	12538	11831	10311	10411	10149	10450	9310	8522	6990	6007	4955	6921
98	12962	13447	14231	14655	14417	14330	14354	13700	13087	12342	10808	10971	10772	11309	10323	9681	8252	7173	6133	6484
99	12886	13363	14152	14404	14146	14042	14058	13244	12627	11893	10361	10505	10286	10758	9735	9064	7620	6553	5509	6378
100	12562	13023	13817	13802	13514	13385	13389	12355	11734	11016	9489	9607	9364	9760	8703	8019	6582	5508	4465	6072
101	12359	12808	13602	13400	13093	12947	12942	11752	11130	10424	8904	9003	8742	9082	8004	7313	5887	4803	3761	5931
102	11647	12084	12877	12533	12214	12058	12048	10823	10201	9493	7973	8074	7819	8209	7196	6603	5293	4129	3128	5322
103	10741	11165	11955	11504	11179	11020	11009	9835	9215	8495	6969	7089	6856	7376	6500	6085	4989	3741	2875	4566
104	9863	10302	11095	10895	10606	10479	10485	9717	9109	8354	6820	7008	6848	7630	6961	6736	5814	4545	3782	3570
105	10415	10872	11666	11690	11422	11313	11328	10657	10050	9293	7760	7949	7787	8527	7784	7451	6378	5132	4253	3957
106	11308	11768	12562	12598	12324	12209	12220	11411	10797	10055	8521	8681	8484	9081	8198	7711	6469	5276	4302	4824
107	11290	11765	12555	12856	12613	12525	12549	11992	11385	10627	9095	9286	9120	9815	8991	8540	7312	6116	5146	4781
108	11869	12354	13139	13603	13377	13301	13331	12849	12243	11483	9951	10145	9980	10659	9799	9295	7998	6836	5835	5393
109	12787	13281	14057	14723	14515	14455	14492	14094	13489	12728	11196	11392	11226	11881	10976	10405	9029	7914	6887	6401
140	22777	23227	24021	23559	23191	22982	22942	20742	20140	19603	18253	18169	17750	17167	15532	14151	12457	12398	11716	16313
141	22001	22444	23237	22679	22302	22087	22042	19778	19178	18651	17314	17221	16796	16184	14543	13156	11468	11434	10775	15568
142	21227	21667	22461	21873	21495	21277	21232	18971	18370	17840	16503	16410	15986	15386	13751	12370	10675	10626	9963	14810
143	20577	21011	21803	21143	20759	20536	20488	18183	17584	17061	15732	15633	15206	14589	12951	11569	9875	9840	9193	14193
144	20155	20579	21369	20582	20185	19952	19897	17488	16893	16388	15085	14969	14532	13856	12204	10806	9131	9156	8557	13834
145	19900	20313	21099	20166	19755	19508	19446	16906	16319	15838	14571	14434	13984	13229	11559	10140	8497	8609	8080	13664
146	19518	19918	20699	19622	19198	18938	18869	16207	15627	15170	13940	13783	13322	12492	10809	9373	7766	7965	7512	13384
147	18654	19067	19852	18942	18537	18295	18236	15781	15187	14686	13393	13271	12830	12152	10505	9116	7430	7453	6878	12430
148	19236	19658	20447	19643	19247	19014	18960	16579	15982	15469	14157	14047	13613	12971	11331	9949	8255	8240	7625	12939
149	19392	19828	20620	20006	19629	19414	19370	17168	16563	16019	14664	14582	14167	13634	12025	10680	8957	8828	8128	13002
150	16524	16971	17765	17384	17039	16855	16828	15039	14419	13802	12362	12350	11987	11776	10314	9149	7403	6904	6006	10084

Project:

Pyhäntä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
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+358104095666
Aarni Nikkola / aarni.nikkola@fcg.fi
Calculated:
30.4.2024 11.00/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB_Yhteisvaikutusmallinnus

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhäntä_Pilpankangas_8.w2r (9)

Area type with hard ground: Järvet_lammet_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: Siemens Gamesa SG 6.6-170 6600 170.0 !O!

Noise: (AM 0, 6.6MW) - 106dB(A) + 2dB(A)

Source Source/Date Creator Edited

SGRE 17.12.2021 USER 12.4.2024 10.51

Siemens Gamesa Renewable Energy and its affiliates reserve the right to change the above specifications without prior notice.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
					[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	215,0	8,0	108,0	No	88,5	95,4	98,1	99,9	103,8	101,9	95,3	85,0

WTG: NORDEX N163/6.X 6800 163.0 !O!

Noise: Nordex N163/6.X Third octave sound power levels, revision 02

Source Source/Date Creator Edited

Nordex 8.11.2021 USER 12.4.2024 11.00

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
					[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	200,0	8,0	109,9	No	93,8	98,6	101,7	103,2	104,8	103,0	91,5	71,3

WTG: NORDEX N163/5.X 5700 163.0 !O!

Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source Source/Date Creator Edited

Nordex 30.8.2019 USER 12.4.2024 10.58

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
					[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	218,5	8,0	111,2	No	91,5	97,7	101,9	105,2	106,6	104,2	95,4	86,6

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB_Yhteisvaikutusmallinnus

WTG: Generic RD200 HH200 7200 200.0 !O!

Noise: V172 - 7,2 MW PO7200 STE + 2dB

Source Source/Date Creator Edited
 Vestas 30.6.2022 USER 25.3.2024 10.00
 DMS no.: 0128-4336_00

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	200,0	8,0	108,9	No	92,4	100,0	103,3	103,5	101,9	97,4	89,9	79,2

Noise sensitive area: A Asuinrakennus A (Nurmiaho)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: B Asuinrakennus B (Kivikangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: C Asuinrakennus C (Koukkula)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: D Asuinrakennus D (Konola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: E Asuinrakennus E (Piippo)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: F Asuinrakennus F (Pääkkö)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: G Lomarakennus G (Pääkkölä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB_Yhteisvaikutusmallinnus

Noise sensitive area: H Asuinrakennus H (Peltola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: I Asuinrakennus I (Nuuttila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: J Lomarakenus J (Ahmokangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: K Asuinrakennus K (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: L Asuinrakennus L (Tuohipuro)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: M Asuinrakennus M (Pilpanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: N Asuinrakennus N (Hanhikaarto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: O Asuinrakennus O (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: P Lomarakenus P (Kuistila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:

Pyhäntä_Pilpankangas

Licensed user:

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Calculated:

30.4.2024 11.00/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB_Yhteisvaikutusmallinnus

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: Q Asuinrakennus Q (Hautalehto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: R Lomarakenus R (Korpelanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: S Asuinrakennus S (Myllymäki)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: T Lomarakenus T (Kärsämäenneva)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

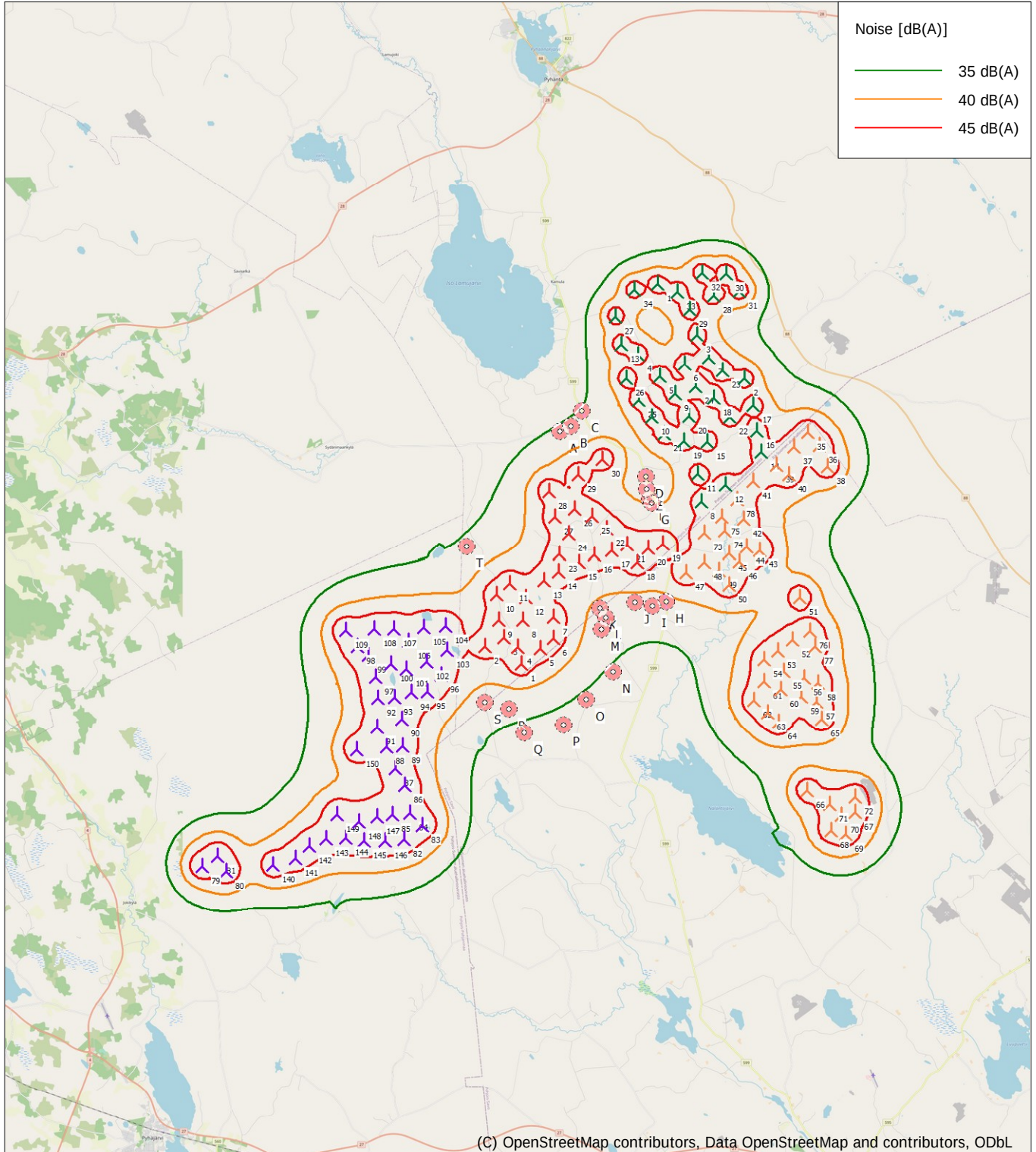
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Map 8,0 m/s

Calculation: Pilpankangas VE1_30xRD200xHH200_20240410_108.9dB_Yhteisvaikutusmallinnus



Map: EMD OpenStreetMap , Print scale 1:250 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 465 949 North: 7 086 500

New WTG Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

6.5.2024

Liite 11. Melun yhteismallinnuksen tulokset hankevaihtoehdossa 2 (VE2).

Project:

Pyhäntä_Pilpankangas

Licensed user:

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Aarni Nikkola / aarni.nikkola@fcg.fi
Calculated:
30.4.2024 14.32/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE2_24xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhäntä

Area type with hard ground: Järvet_lammet_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

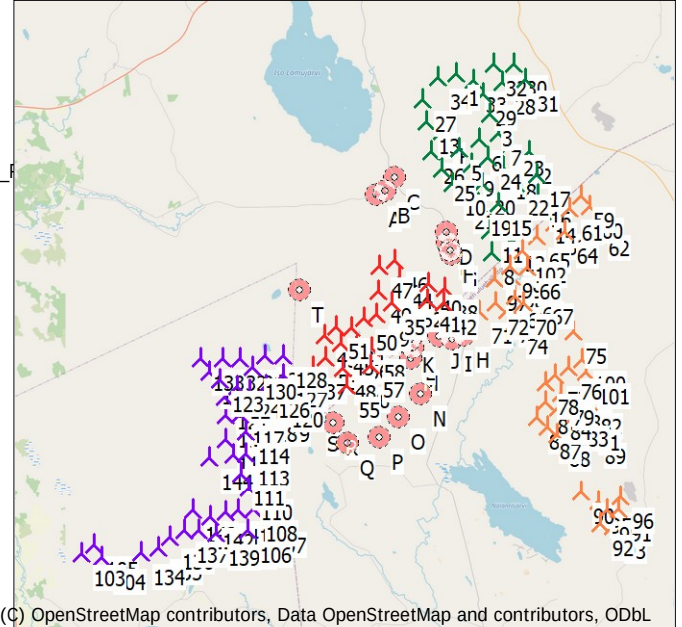
Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more

restrictive, positive is less restrictive.:

0,0 dB(A)



All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]
					Valid	Manufact.					Creator	Name		
				[m]										
1	471 839	7 098 977	152,4	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
2	475 592	7 094 825	177,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
3	473 530	7 096 766	168,7	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
4	470 952	7 095 933	163,7	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
5	471 895	7 094 973	170,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
6	472 999	7 095 500	175,0	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
7	474 026	7 095 796	179,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
8	473 642	7 089 459	165,9	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
9	472 556	7 094 191	172,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
10	471 545	7 093 189	175,1	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
11	473 523	7 090 697	166,4	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
12	474 724	7 090 192	163,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
13	470 207	7 096 391	155,8	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
14	476 298	7 091 642	169,7	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
15	473 955	7 092 082	169,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
16	476 097	7 092 536	175,0	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
17	475 979	7 093 646	177,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
18	474 232	7 094 014	173,4	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
19	472 921	7 092 121	171,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
20	473 133	7 093 196	170,1	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
21	472 045	7 092 434	174,8	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
22	474 928	7 093 153	170,9	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
23	474 653	7 095 212	177,9	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
24	473 450	7 094 501	175,0	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
25	470 952	7 093 929	178,3	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
26	470 430	7 094 892	173,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
27	469 994	7 097 616	152,3	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
28	474 257	7 098 465	167,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
29	473 217	7 097 856	165,0	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
30	474 833	7 099 446	158,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
31	475 413	7 098 667	166,8	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
32	473 764	7 099 462	155,4	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
33	472 690	7 098 642	163,3	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
34	470 814	7 098 750	149,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
35	468 261	7 086 867	156,9	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
36	466 361	7 082 992	166,9	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
37	464 036	7 083 492	147,5	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
38	471 111	7 087 617	166,5	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
39	467 461	7 086 317	159,1	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
40	470 261	7 087 917	162,5	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
41	470 186	7 087 042	157,2	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
42	471 011	7 086 842	163,3	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
43	464 686	7 085 217	154,0	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
44	468 686	7 088 267	159,3	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
45	465 536	7 084 792	162,6	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
46	468 449	7 089 139	165,0	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
47	467 636	7 088 842	165,8	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
48	465 586	7 083 442	162,5	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
49	467 511	7 087 492	165,9	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
50	466 761	7 086 117	170,0	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
51	465 286	7 085 667	158,8	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
52	469 186	7 087 292	156,5	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
53	464 736	7 084 017	151,7	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
54	466 111	7 085 542	160,4	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
55	465 786	7 082 517	166,3	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
56	466 336	7 084 592	161,7	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
57	467 111	7 083 592	159,6	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9

To be continued on next page...

Project:

Pyhäntä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy

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Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

30.4.2024 14.32/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE2_24xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

...continued from previous page

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]
					Valid	Manufact.					Creator	Name		
			[m]											
58	467 136	7 084 492	159,4	Generic RD200 HH200 7200 200....	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
59	478 336	7 092 455	177,4	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
60	478 845	7 091 899	190,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
61	477 742	7 091 824	177,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
62	479 177	7 090 979	185,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
63	476 955	7 091 051	172,8	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
64	477 487	7 090 620	182,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
65	475 964	7 090 352	164,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
66	475 501	7 088 705	162,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
67	476 189	7 087 343	162,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
68	475 611	7 087 510	161,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
69	474 845	7 087 199	160,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
70	475 310	7 086 848	160,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
71	472 937	7 086 386	170,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
72	473 780	7 086 830	165,6	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
73	474 399	7 086 459	160,6	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
74	474 825	7 085 835	158,1	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
75	477 918	7 085 282	163,9	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
76	477 610	7 083 418	159,9	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
77	476 957	7 082 967	158,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
78	476 370	7 082 551	156,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
79	477 187	7 082 052	160,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
80	478 121	7 081 764	160,1	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
81	478 641	7 080 668	158,8	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
82	478 709	7 081 538	163,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
83	477 972	7 080 917	155,3	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
84	477 084	7 081 229	157,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
85	476 355	7 081 061	162,8	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
86	475 903	7 080 778	161,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
87	476 526	7 080 222	157,4	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
88	476 972	7 079 815	154,3	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
89	478 868	7 079 944	156,8	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
90	478 217	7 076 798	138,3	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
91	480 292	7 075 796	153,1	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
92	479 248	7 075 045	139,8	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
93	479 889	7 074 867	140,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
94	479 686	7 075 714	147,9	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
95	479 198	7 076 190	147,3	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
96	480 317	7 076 500	159,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
97	473 769	7 088 131	166,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
98	474 672	7 088 183	162,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
99	474 559	7 088 784	163,0	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
100	478 369	7 083 786	163,1	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
101	478 581	7 083 109	162,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
102	475 224	7 089 562	162,5	NORDEX N163/6.X 6800 163,0 IO....	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
103	451 581	7 073 772	158,8	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
104	452 643	7 073 538	167,5	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
105	452 257	7 074 208	165,0	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
106	460 464	7 074 829	160,9	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
107	461 281	7 075 412	170,0	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
108	460 757	7 075 976	167,3	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
109	459 969	7 075 947	160,0	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
110	460 546	7 077 169	160,0	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
111	460 145	7 077 917	160,0	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
112	459 750	7 078 896	159,8	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
113	460 442	7 078 943	157,5	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
114	460 444	7 080 110	153,9	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
115	459 354	7 079 749	160,0	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
116	459 388	7 081 028	159,9	NORDEX N163/5.X 5700 163,0 IO....	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,				

DECIBEL - Main Result

Calculation: Pilpankangas VE2_24xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

...continued from previous page

Noise sensitive area

No.	Name	East	North	Z [m]	Immission height [m]	Demands		Sound level		Distance to noise demand [m]
						Noise [dB(A)]	From WTGs [dB(A)]			
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	4,0	40,0	33,2			1 646
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	4,0	40,0	37,3			1 114
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	4,0	40,0	37,8			938
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	4,0	40,0	38,5			562
G	Lomarakennus G (Pääkkölä)	471 494	7 089 419	197,5	4,0	40,0	38,9			420
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	4,0	40,0	38,6			364
I	Asuinrakennus I (Nuutila)	471 499	7 084 904	165,2	4,0	40,0	37,7			716
J	Lomarakennus J (Ahmokangas)	470 723	7 085 089	155,0	4,0	40,0	38,3			475
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	4,0	40,0	38,9			408
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	4,0	40,0	37,9			821
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	4,0	40,0	37,5			775
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	4,0	40,0	34,2			1 885
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	4,0	40,0	34,0			1 753
P	Lomarakennus P (Kuistila)	467 531	7 079 776	162,3	4,0	40,0	33,1			2 075
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	4,0	40,0	33,7			1 988
R	Lomarakennus R (Korpelanperä)	465 124	7 080 510	140,0	4,0	40,0	36,4			997
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	4,0	40,0	37,7			787
T	Lomarakennus T (Kärsämäenneva)	463 349	7 087 611	152,5	4,0	40,0	35,4			1 365

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	7696	7252	6460	8428	8978	9390	9565	13879	14077	13933	14345	14736	15254	17049	18423	19679	20446	19650	19773	14187
2	8356	7857	7262	6092	6469	6713	6784	10336	10732	10886	11824	12079	12589	14041	15652	17072	18232	17734	18145	14210
3	7300	6795	6048	6608	7119	7484	7624	11754	12034	12010	12653	12992	13515	15187	16678	18018	18968	18301	18558	13692
4	4774	4289	3504	5370	5924	6350	6537	10893	11042	10847	11195	11594	12110	13929	15273	16515	17276	16488	16629	11272
5	4963	4453	3751	4452	4995	5400	5569	9875	10076	9954	10450	10819	11341	13094	14515	15811	16683	15970	16191	11280
6	6185	5675	4974	5237	5750	6120	6265	10440	10701	10657	11282	11624	12147	13831	15312	16648	17596	16933	17199	12464
7	7234	6724	6034	5926	6405	6739	6862	10870	11181	11205	11938	12253	12775	14389	15919	17287	18304	17689	17998	13453
8	6862	6578	6558	2654	2443	2266	2149	4626	5033	5256	6380	6557	7043	8363	10005	11450	12717	12355	12895	10458
9	5265	4763	4162	3855	4369	4741	4889	9103	9346	9285	9900	10242	10765	12455	13931	15266	16221	15570	15852	11317
10	4050	3571	3101	2637	3184	3595	3771	8108	8285	8142	8637	9003	9525	11277	12698	14001	14898	14212	14469	9914
11	6278	5927	5777	2295	2359	2408	2398	5777	6136	6268	7249	7481	7986	9428	11034	12457	13646	13203	13677	10632
12	7576	7229	7074	3513	3464	3396	3322	5732	6193	6485	7664	7822	8299	9535	11201	12659	13967	13635	14190	11664
13	4640	4195	3403	5910	6460	6894	7090	11447	11559	11314	11559	11977	12485	14342	15629	16829	17512	16675	16762	11141
14	8811	8390	8052	5178	5290	5326	5294	7777	8272	8604	9804	9957	10429	11608	13289	14754	16090	15773	16330	13562
15	6437	6009	5672	3114	3392	3578	3627	7226	7586	7704	8632	8885	9395	10871	12467	13882	15039	14557	14992	11510
16	8559	8110	7697	5248	5451	5558	5561	8448	8911	9186	10307	10494	10981	12253	13916	15371	16655	16282	16795	13667
17	8506	8028	7524	5656	5949	6127	6164	9388	9823	10043	11083	11302	11801	13157	14799	16241	17471	17041	17508	13998
18	6842	6351	5801	4567	4978	5257	5349	9167	9511	9590	10430	10714	11231	12770	14340	15736	16833	16289	16665	12627
19	5403	4979	4665	2293	2678	2956	3056	7070	7355	7368	8143	8440	8960	10552	12091	13471	14539	13986	14365	10581
20	5627	5154	4685	3241	3687	4002	4118	8163	8451	8458	9202	9509	10031	11642	13171	14543	15584	15003	15352	11266
21	4509	4072	3736	2033	2539	2913	3065	7334	7549	7463	8075	8413	8936	10628	12101	13439	14413	13787	14102	9944
22	7410	6943	6479	4509	4822	5022	5073	8538	8933	9095	10064	10306	10813	12245	13861	15286	16468	15999	16439	12837
23	7580	7074	6436	5766	6202	6498	6599	10431	10779	10859	11685	11974	12492	14039	15607	17000	18082	17520	17876	13622
24	6211	5708	5098	4513	4988	5322	5446	9499	9793	9799	10520	10837	11359	12983	14505	15870	16888	16281	16602	12227
25	3665	3157	2537	3370	3924	4352	4543	8902	9041	8843	9220	9611	10129	11934	13298	14561	15375	14630	14826	9886
26	3693	3194	2430	4395	4945	5379	5576	9932	10045	9808	10091	10500	11012	12854	14167	15392	16128	15330	15465	10156
27	5589	5189	4419	7153	7704	8137	8333	12691	12800	12548	12765	13188	13694	15562	16828	18009	18652	17786	17837	12011
28	8922	8427	7653	8454	8962	9322	9459	13539	13838	13835	14498	14835	15358	17016	18518	19863	20816	20145	20392	15388
29	7741	7251	6471	7551	8078	8460	8611	12806	13065	13009	13587	13942	14465	16176	17636	18953	19850	19141	19356	14225
30	10007	9517	8737	9578	10081	10436	10569	14606	14919	14934	15620	15951	16474	18117	19630	20982	21947	21280	21530	16491
31	9944	9442	8681	9112	9593	9925	10045	13968	14308	14365	15125	15436	15958	17549	19095	20470	21492	20870	21162	16364
32	9269	8793	8002	9245	9770	10148	10297	14459	14733	14691	15283	15637	16160	17862	19330	20649	21544	20829	21032	15777
33	7944	7474	6681	8202	8741	9139	9301	13555	13789	13695	14201	14573	15094	16844	18268	19559	20398	19647	19819	14455
34	6972	6559	5779	8190	8744	9170	9356	13710	13862	13662	13967	14377	14889	16728	18043	19256	19948	19107	19182	13409
35	5773	5967	6609	4747	4352	4145	4118	4219	3786	3037	2203	2691	3093	5038	6023	7129	7822	7090	7372	4969
36	9674	9970	10688	9008	8567	8296	8224	6106	5482	4839	3409	3387	3054	3518	3057	3423	3595	2774	3160	5514
37	9753	10140	10916	10093	9737	9550	9525	8215	7595	6874	5349	5469	5247	5894	5223	5102	4424	3175	2715	4176
38	6127	6073	6429	2956	2405	1998	1841	2702	2741	2558	3340	3598	4114	5725	7238	8620	9746	9294	9790	7763
39	6278	6533	7225	5684	5306	5111	5087	4788	4278	3485	2261	2715	2983	4839	5572	6542	7073	6260	6476	4311
40	5412	5410	5841	2825	2327	2019	1942	3360	3257	2866	3220	3577	4099	5884	7273	8587	9575	9015	9426	6919
41	6151	6188	6659	3680	3164	2820	2712	2721	2509	2026	2379	2712	3235	5006	6406	7737	8773	8265	8730	6861
42	6719	6704	7106	3735	3185	2780	2621	2051	1998	1777	2672	2880	3386	4949	6480	7877	9048	8647	9190	7701
43	7910	8298	9076	8456	8143	8000	7999	7407	6820	6038	4530	4800	4752	5972	5825	6140	5886	4728	4477	2742
44	4477	4614	5211	3433	3116	3005	3034	4651	4384	3775	3431	3898	4364	6303	7418	8570	9285	8537	8779	5378
45	8055	8403	9159	8113	7753	7566	7543	6563	5964	5195	3668	3903	3824	5027	4957	5399	5360	4302	4261	3568

To be continued on next page...

Project:

Pyhäntä_Pilpankangas

Licensed user:

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Calculated:

30.4.2024 14.32/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE2_24xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

...continued from previous page

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
46	3573	3717	4334	3129	2949	2967	3058	5440	5219	4645	4330	4799	5261	7203	8289	9409	10052	9248	9421	5324
47	3754	4002	4703	3989	3813	3820	3900	5819	5516	4860	4265	4751	5164	7109	8043	9067	9579	8703	8803	4461
48	9358	9690	10433	9093	8687	8453	8403	6714	6091	5394	3891	3964	3712	4391	3931	4151	4009	2969	3048	4731
49	5102	5358	6055	4829	4523	4405	4424	5168	4754	4011	3116	3602	3960	5881	6721	7717	8231	7379	7528	4164
50	6524	6823	7549	6310	5957	5783	5770	5427	4891	4093	2739	3146	3317	5044	5560	6388	6745	5842	5963	3725
51	7284	7655	8425	7706	7393	7252	7253	6830	6260	5467	3996	4315	4336	5744	5814	6305	6250	5160	5029	2745
52	5552	5663	6224	3864	3427	3182	3138	3640	3324	2686	2417	2862	3352	5267	6474	7697	8548	7906	8261	5846
53	9024	9394	10161	9227	8866	8677	8651	7435	6821	6082	4549	4706	4529	5386	4951	5080	4702	3529	3300	3852
54	7195	7525	8270	7176	6825	6649	6633	5997	5426	4634	3163	3490	3536	5041	5284	5939	6110	5129	5169	3451
55	10229	10544	11276	9721	9287	9024	8955	6814	6192	5566	4152	4114	3758	3993	3221	3250	3078	2114	2418	5647
56	8092	8401	9130	7727	7329	7106	7063	5778	5172	4414	2881	3090	2999	4255	4343	4963	5180	4259	4418	4247
57	9012	9278	9972	8104	7650	7368	7290	5204	4580	3909	2454	2462	2181	3056	3093	3840	4352	3668	4117	5505
58	8112	8380	9077	7329	6897	6639	6577	4993	4382	3636	2102	2287	2198	3575	3904	4733	5224	4462	4793	4906
59	10798	10350	9932	7350	7480	7520	7486	9648	10186	10594	11868	11987	12441	13484	15185	16659	18064	17812	18407	15751
60	11328	10892	10507	7728	7811	7811	7759	9583	10143	10600	11928	12017	12454	13400	15106	16583	18032	17832	18463	16079
61	10232	9801	9431	6630	6725	6740	6695	8783	9319	9728	11009	11123	11576	12619	14319	15793	17197	16948	17548	14997
62	11750	11336	11007	7956	7971	7918	7840	9206	9790	10304	11693	11743	12157	12979	14686	16160	17659	17524	18198	16183
63	9542	9137	8837	5743	5784	5761	5700	7685	8219	8625	9911	10022	10473	11523	13222	14695	16095	15846	16450	14034
64	10143	9748	9471	6256	6252	6192	6113	7719	8278	8738	10081	10160	10593	11540	13246	14722	16167	15971	16611	14455
65	8719	8347	8130	4737	4712	4645	4567	6525	7043	7428	8700	8817	9272	10364	12056	13527	14906	14642	15240	12909
66	8862	8566	8506	4659	4436	4216	4071	4962	5519	5992	7371	7425	7848	8790	10493	11969	13408	13223	13881	12201
67	10120	9863	9867	5915	5604	5311	5134	4671	5286	5913	7409	7363	7715	8330	10031	11499	13046	13005	13751	12843
68	9540	9291	9314	5343	5018	4718	4538	4265	4868	5455	6928	6908	7281	8004	9711	11185	12696	12609	13330	12263
69	9083	8868	8954	4942	4557	4214	4020	3462	4057	4631	6101	6084	6462	7238	8945	10421	11910	11800	12512	11504
70	9665	9451	9532	5522	5140	4796	4602	3662	4278	4913	6418	6361	6708	7339	9043	10514	12048	11998	12743	11986
71	8228	8122	8385	4519	3999	3570	3359	1539	2064	2566	4028	4017	4412	5375	7067	8539	9952	9776	10461	9667
72	8496	8335	8512	4526	4060	3663	3454	2417	2985	3518	4977	4970	5361	6246	7949	9424	10870	10718	11411	10460
73	9204	9034	9193	5190	4742	4354	4147	2677	3290	3923	5431	5370	5718	6401	8109	9583	11093	11019	11756	11110
74	9939	9777	9944	5944	5493	5101	4893	2830	3453	4169	5703	5579	5874	6325	8019	9482	11053	11067	11852	11613
75	12697	12469	12515	8525	8167	7834	7641	5829	6430	7198	8724	8537	8757	8779	10370	11756	13444	13655	14527	14754
76	13625	13455	13597	9583	9155	8774	8568	5768	6289	7087	8532	8250	8362	7974	9424	10717	12453	12820	13759	14865
77	13468	13327	13514	9518	9062	8664	8454	5311	5791	6585	7985	7676	7754	7261	8676	9951	11692	12085	13036	14379
78	13374	13259	13487	9524	9045	8634	8423	4980	5410	6192	7535	7200	7241	6636	8011	9265	11010	11431	12392	13970
79	14291	14166	14376	10394	9926	9521	9310	5937	6363	7142	8469	8123	8145	7434	8728	9921	11673	12162	13143	14913
80	15142	15000	15182	11181	10730	10335	10125	6890	7329	8111	9445	9100	9121	8373	9622	10775	12529	13058	14050	15888
81	16295	16164	16361	12368	11909	11509	11299	7907	8304	9069	10333	9960	9932	8996	10100	11146	12890	13518	14535	16795
82	15717	15567	15734	11726	11284	10893	10685	7514	7957	8740	10075	9729	9745	8971	10189	11316	13068	13624	14622	16517
83	15660	15539	15754	11774	11306	10900	10689	7216	7602	8364	9621	9247	9218	8298	9430	10503	12252	12855	13867	16083
84	14842	14738	14978	11023	10541	10128	9916	6317	6686	7441	8684	8307	8277	7378	8550	9663	11416	11982	12986	15146
85	14092	14000	14259	10330	9836	9418	9206	5515	5873	6625	7866	7491	7467	6618	7848	9011	10764	11284	12276	14328
86	14478	14415	14718	10850	10339	9912	9701	5762	6035	6739	7854	7443	7354	6282	7361	8432	10182	10783	11797	14294
87	15293	15223	15515	11624	11120	10695	10484	6592	6870	7574	8677	8261	8159	7017	8008	9006	10745	11406	12432	15108
88	15884	15811	16095	12192	11691	11268	11057	7193	7474	8177	9272	8853	8743	7559	8493	9441	11169	11869	12902	15696
89	16982	16860	17071	13085	12621	12217	12006	8514	8882	9633	10850	10460	10402	9356	10365	11338	13068	13756	14785	17309
90	19068	19014	19322	15443	14937	14511	14300	10317	10528	11176	12104	11651	11454	9965	10490	11093	12686	13610	14662	18385
91	21092	21010	21274	17332	16846	16429	16218	12402	12661	13339	14333	13888	13710	12259	12791	13368	14934	15885	16936	20657
92	21098	21047	21356	17473	16969	16544	16332	12342	12540	13174	14055	13594	13373	11803	12179	12636	14139	15145	16191	20266
93	21606	21544	21838	17932	17434	17012	16800	12865	13082	13730	14641	14184	13973	12427	12828	13298	14804	15807	16854	20881
94	20798	20728	21012	17094	16599	16179	15967	12074	12309	12971	13923	13472	13279	11786	12271	12816	14368	15332	16383	20211
95	20126	20060	20349	16439	15942	15520	15308	11396	11628	12289	13241	12791	12600	11118	11630	12205	13777	14722	15774	19535
96	20551	20458	20706	16749	16269	15856	15644	11900	12182	12877	13917	13481	13325	11936	12553	13199	14803	15714	16766	20283
97	7664	7445	7533	3519	3135	2803	261													

Project:

Pyhäntä_Pilpankangas

Licensed user:

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Calculated:

30.4.2024 14.32/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE2_24xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
117	13709	14153	14947	14617	14288	14121	14105	12623	11999	11330	9840	9886	9575	9670	8411	7507	5902	5020	3982	7299
118	13127	13562	14355	13922	13585	13411	13391	11874	11250	10581	9093	9137	8826	8943	7715	6863	5307	4356	3307	6787
119	12782	13204	13994	13401	13048	12860	12833	11201	10577	9920	8443	8471	8149	8232	7002	6167	4643	3655	2604	6561
120	11845	12262	13050	12441	12092	11909	11884	10370	9746	9067	7572	7627	7331	7565	6462	5798	4451	3304	2289	5704
121	13423	13887	14681	14691	14402	14271	14273	13160	12538	11831	10311	10411	10149	10450	9310	8522	6990	6007	4955	6921
122	12962	13447	14231	14655	14417	14330	14354	13700	13087	12342	10808	10971	10772	11309	10323	9681	8252	7173	6133	6484
123	12886	13363	14152	14404	14146	14042	14058	13244	12627	11893	10361	10505	10286	10758	9735	9064	7620	6553	5509	6378
124	12562	13023	13817	13802	13514	13385	13389	12355	11734	11016	9489	9607	9364	9760	8703	8019	6582	5508	4465	6072
125	12359	12808	13602	13400	13093	12947	12942	11752	11130	10424	8904	9003	8742	9082	8004	7313	5887	4803	3761	5931
126	11647	12084	12877	12533	12214	12058	12048	10823	10201	9493	7973	8074	7819	8209	7196	6603	5293	4129	3128	5322
127	10741	11165	11955	11504	11179	11020	11009	9835	9215	8495	6969	7089	6856	7376	6500	6085	4989	3741	2875	4566
128	9863	10302	11095	10895	10606	10479	10485	9717	9109	8354	6820	7008	6848	7630	6961	6736	5814	4545	3782	3570
129	10415	10872	11666	11690	11422	11313	11328	10657	10050	9293	7760	7949	7787	8527	7784	7451	6378	5132	4253	3957
130	11308	11768	12562	12598	12324	12209	12220	11411	10797	10055	8521	8681	8484	9081	8198	7711	6469	5276	4302	4824
131	11290	11765	12555	12856	12613	12525	12549	11992	11385	10627	9095	9286	9120	9815	8991	8540	7312	6116	5146	4781
132	11869	12354	13139	13603	13377	13301	13331	12849	12243	11483	9951	10145	9980	10659	9799	9295	7998	6836	5835	5393
133	12787	13281	14057	14723	14515	14455	14492	14094	13489	12728	11196	11392	11226	11881	10976	10405	9029	7914	6887	6401
134	22777	23227	24021	23559	23191	22982	22942	20742	20140	19603	18253	18169	17750	17167	15532	14151	12457	12398	11716	16313
135	22001	22444	23237	22679	22302	22087	22042	19778	19178	18651	17314	17221	16796	16184	14543	13156	11468	11434	10775	15568
136	21227	21667	22461	21873	21495	21277	21232	18971	18370	17840	16503	16410	15986	15386	13751	12370	10675	10626	9963	14810
137	20577	21011	21803	21143	20759	20536	20488	18183	17584	17061	15732	15633	15206	14589	12951	11569	9875	9840	9193	14193
138	20155	20579	21369	20582	20185	19952	19897	17488	16893	16388	15085	14969	14532	13856	12204	10806	9131	9156	8557	13834
139	19900	20313	21099	20166	19755	19508	19446	16906	16319	15838	14571	14434	13984	13229	11559	10140	8497	8609	8080	13664
140	19518	19918	20699	19622	19198	18938	18869	16207	15627	15170	13940	13783	13322	12492	10809	9373	7766	7965	7512	13384
141	18654	19067	19852	18942	18537	18295	18236	15781	15187	14686	13393	13271	12830	12152	10505	9116	7430	7453	6878	12430
142	19236	19658	20447	19643	19247	19014	18960	16579	15982	15469	14157	14047	13613	12971	11331	9949	8255	8240	7625	12939
143	19392	19828	20620	20006	19629	19414	19370	17168	16563	16019	14664	14582	14167	13634	12025	10680	8957	8828	8128	13002
144	16524	16971	17765	17384	17039	16855	16828	15039	14419	13802	12362	12350	11987	11776	10314	9149	7403	6904	6006	10084

Project:

Pyhäntä_Pilpankangas

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Calculated:
30.4.2024 14.32/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE2_24xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhäntä_Pilpankangas_8.w2r (9)

Area type with hard ground: Järvet_lammet_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: Siemens Gamesa SG 6.6-170 6600 170.0 !O!

Noise: (AM 0, 6.6MW) - 106dB(A) + 2dB(A)

Source Source/Date Creator Edited

SGRE 17.12.2021 USER 12.4.2024 10.51

Siemens Gamesa Renewable Energy and its affiliates reserve the right to change the above specifications without prior notice.

Status	Hub height	Wind speed	LwA,ref	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
	[m]	[m/s]	[dB(A)]		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	215,0	8,0	108,0	No	88,5	95,4	98,1	99,9	103,8	101,9	95,3	85,0

WTG: Generic RD200 HH200 7200 200.0 !O!

Noise: V172 - 7,2 MW PO7200 STE + 2dB

Source Source/Date Creator Edited

Vestas 30.6.2022 USER 25.3.2024 10.00

DMS no.: 0128-4336_00

Status	Hub height	Wind speed	LwA,ref	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
	[m]	[m/s]	[dB(A)]		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	200,0	8,0	108,9	No	92,4	100,0	103,3	103,5	101,9	97,4	89,9	79,2

WTG: NORDEX N163/6.X 6800 163.0 !O!

Noise: Nordex N163/6.X Third octave sound power levels, revision 02

Source Source/Date Creator Edited

Nordex 8.11.2021 USER 12.4.2024 11.00

Status	Hub height	Wind speed	LwA,ref	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
	[m]	[m/s]	[dB(A)]		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	200,0	8,0	109,9	No	93,8	98,6	101,7	103,2	104,8	103,0	91,5	71,3

Project:

Pyhäntä_Pilpankangas

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Calculated:
30.4.2024 14.32/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE2_24xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

WTG: NORDEX N163/5.X 5700 163.0 !O!

Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	12.4.2024 10.58

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	218,5	8,0	111,2	No	91,5	97,7	101,9	105,2	106,6	104,2	95,4	86,6

Noise sensitive area: A Asuinrakennus A (Nurmiaho)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: B Asuinrakennus B (Kivikangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: C Asuinrakennus C (Koukkula)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: D Asuinrakennus D (Konola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: E Asuinrakennus E (Piippo)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: F Asuinrakennus F (Pääkkö)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: G Lomarakennus G (Pääkkölä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE2_24xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

Noise sensitive area: H Asuinrakennus H (Peltola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: I Asuinrakennus I (Nuuttila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: J Lomarakenus J (Ahmokangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: K Asuinrakennus K (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: L Asuinrakennus L (Tuohipuro)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: M Asuinrakennus M (Pilpanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: N Asuinrakennus N (Hanhikaarto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: O Asuinrakennus O (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: P Lomarakenus P (Kuistila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:

Pyhäntä_Pilpankangas

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Calculated:
30.4.2024 14.32/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE2_24xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: Q Asuinrakennus Q (Hautalehto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: R Lomarakenus R (Korpelanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: S Asuinrakennus S (Myllymäki)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: T Lomarakenus T (Kärsämäenneva)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

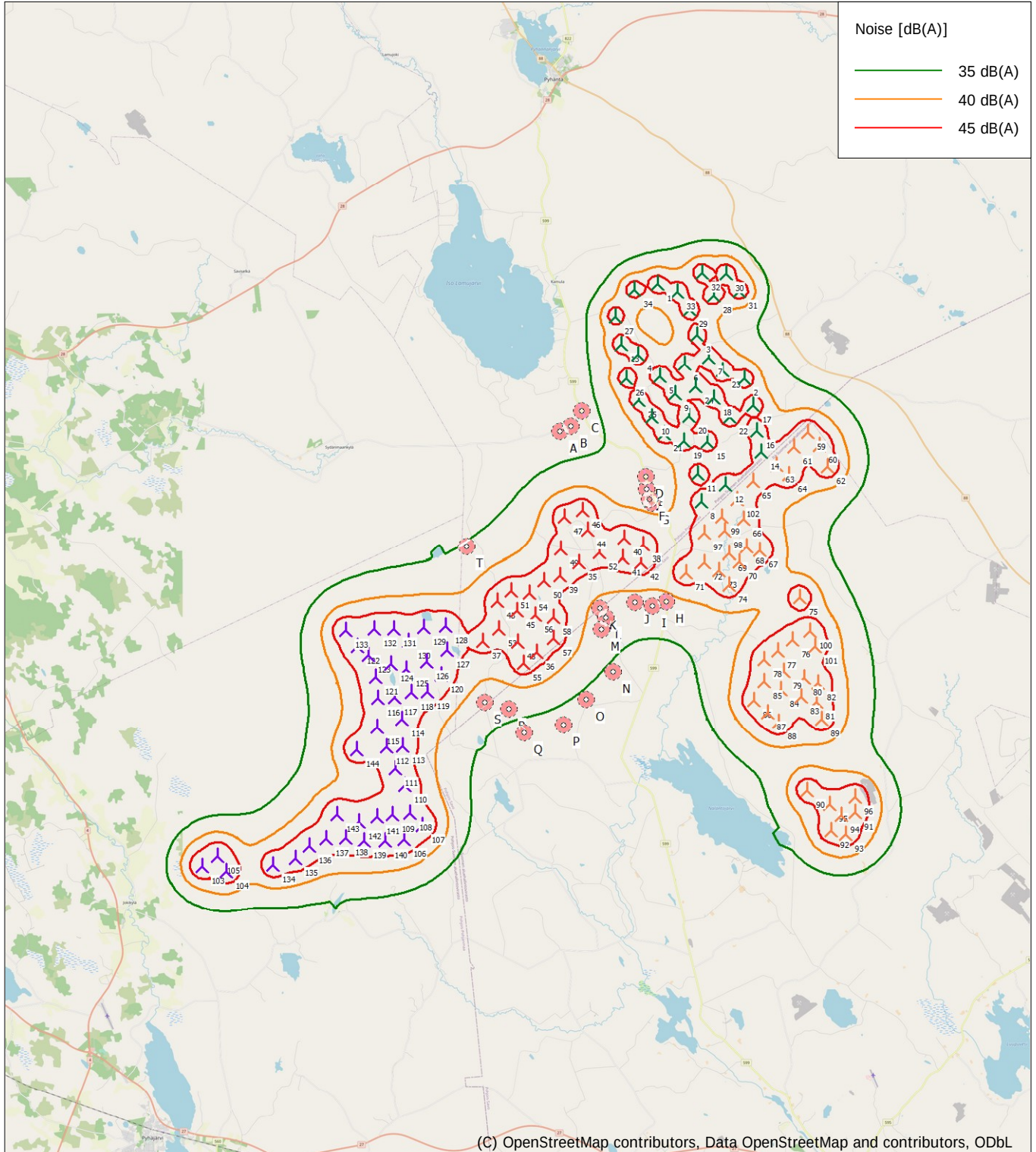
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Map 8,0 m/s

Calculation: Pilpankangas VE2_24xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus



Map: EMD OpenStreetMap , Print scale 1:250 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 465 949 North: 7 086 500

New WTG Noise sensitive area

Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

6.5.2024

Liite 12. Melun yhteismallinnuksen tulokset hankevaihtoehdossa 3 (VE3).

Project:

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30.4.2024 15.41/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE3_14xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhäntä

Area type with hard ground: Järvet_lammet_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

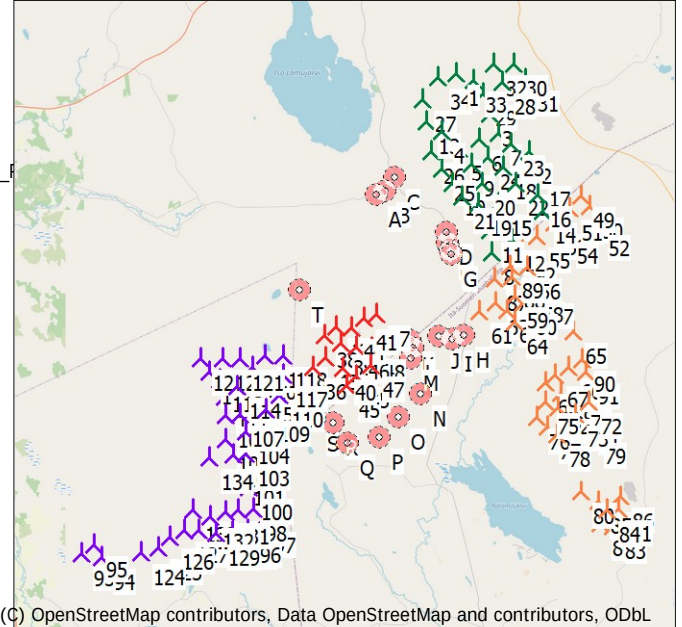
Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more

restrictive, positive is less restrictive.:

0,0 dB(A)



All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA_ref [dB(A)]
				Valid	Manufact.					Creator	Name		
1 471 839	7 098 977	152,4	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
2 475 592	7 094 825	177,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
3 473 530	7 096 766	168,7	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
4 470 952	7 095 933	163,7	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
5 471 895	7 094 973	170,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
6 472 999	7 095 500	175,0	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
7 474 026	7 095 796	179,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
8 473 642	7 089 459	165,9	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
9 472 556	7 094 191	172,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
10 471 545	7 093 189	175,1	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
11 473 523	7 090 697	166,4	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
12 474 724	7 090 192	163,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
13 470 207	7 096 391	155,8	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
14 476 298	7 091 642	169,7	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
15 473 955	7 092 082	169,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
16 476 097	7 092 536	175,0	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
17 475 979	7 093 646	177,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
18 474 232	7 094 014	173,4	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
19 472 921	7 092 121	171,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
20 473 133	7 093 196	170,1	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
21 472 045	7 092 434	174,8	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
22 474 928	7 093 153	170,9	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
23 474 653	7 095 212	177,9	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
24 473 450	7 094 501	175,0	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
25 470 952	7 093 929	178,3	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
26 470 430	7 094 892	173,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
27 469 994	7 097 616	152,3	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
28 474 257	7 098 465	167,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
29 473 217	7 097 856	165,0	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
30 474 833	7 099 446	158,5	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
31 475 413	7 098 667	166,8	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
32 473 764	7 099 462	155,4	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
33 472 690	7 098 642	163,3	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
34 470 814	7 098 750	149,2	Siemens Gamesa SG 6.6-170 660...	Yes	Siemens Gamesa	SG 6.6-170-6 600	6 600	170,0	215,0	USER	(AM 0, 6.6MW) - 106dB(A) + 2dB(A)	8,0	108,0
35 466 361	7 082 992	166,9	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
36 464 036	7 083 492	147,5	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
37 467 461	7 086 317	159,1	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
38 464 686	7 085 217	154,0	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
39 465 536	7 084 792	162,6	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
40 465 586	7 083 442	162,5	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
41 466 761	7 086 117	170,0	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
42 465 286	7 085 667	158,8	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
43 464 736	7 084 017	151,7	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
44 466 111	7 085 542	160,4	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
45 465 786	7 082 517	166,3	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
46 466 336	7 084 592	161,7	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
47 467 111	7 083 592	159,6	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
48 467 136	7 084 492	159,4	Generic RD200 HH200 7200 200...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	USER	V172 - 7,2 MW P07200 STE + 2dB	8,0	108,9
49 478 336	7 092 455	177,4	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
50 478 845	7 091 899	190,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
51 477 742	7 091 824	177,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
52 479 177	7 090 979	185,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
53 476 955	7 091 051	172,8	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
54 477 487	7 090 620	182,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
55 475 964	7 090 352	164,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
56 475 501	7 088 705	162,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
57 476 189	7 087 343	162,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9

To be continued on next page...

Project:

Pyhäntä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy
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Aarni Nikkola / aarni.nikkola@fcg.fi
Calculated:
30.4.2024 15.41/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE3_14xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

...continued from previous page

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	LwA,ref [dB(A)]
					Valid	Manufact.					Creator	Name		
			[m]											
58	475 611	7 087 510	161,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
59	474 845	7 087 199	160,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
60	475 310	7 086 848	160,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
61	472 937	7 086 386	170,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
62	473 780	7 086 830	165,6	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
63	474 399	7 086 459	160,6	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
64	474 825	7 085 835	158,1	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
65	477 918	7 085 282	163,9	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
66	477 610	7 083 418	159,9	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
67	476 957	7 082 967	158,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
68	476 370	7 082 551	156,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
69	477 187	7 082 052	160,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
70	478 121	7 081 764	160,1	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
71	478 641	7 080 668	158,8	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
72	478 709	7 081 538	163,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
73	477 972	7 080 917	155,3	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
74	477 084	7 081 229	157,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
75	476 355	7 081 601	162,8	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
76	475 903	7 080 778	161,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
77	476 526	7 080 222	157,4	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
78	476 972	7 079 815	154,3	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
79	478 868	7 079 944	156,8	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
80	478 217	7 076 798	138,3	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
81	480 292	7 075 796	153,1	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
82	479 248	7 075 045	139,8	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
83	479 889	7 074 867	140,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
84	479 686	7 075 714	147,9	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
85	479 198	7 076 190	147,3	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
86	480 317	7 076 500	159,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
87	473 769	7 088 131	166,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
88	474 672	7 088 183	162,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
89	474 559	7 088 784	163,0	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
90	478 369	7 083 786	163,1	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
91	478 581	7 083 109	162,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
92	475 224	7 089 562	162,5	NORDEX N163/6.X 6800 163,0 IO...	Yes	NORDEX	N163/6.X-6 800	6 800	163,0	200,0	USER	Nordex N163/6.X Third octave sound power levels, revision 02	8,0	109,9
93	451 581	7 073 772	158,8	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
94	452 643	7 073 538	167,5	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
95	452 257	7 074 208	165,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
96	460 464	7 074 829	160,9	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
97	461 281	7 075 412	170,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
98	460 757	7 075 976	167,3	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
99	459 969	7 075 947	160,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
100	460 546	7 077 169	160,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
101	460 145	7 077 917	160,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
102	459 750	7 078 896	159,8	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
103	460 442	7 078 943	157,5	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
104	460 444	7 080 110	153,9	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
105	459 354	7 079 749	160,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
106	459 388	7 081 028	159,9	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
107	460 134	7 081 058	153,1	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
108	460 841	7 081 305	154,3	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
109	461 555	7 081 300	161,5	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
110	462 188	7 082 027	170,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
111	459 303	7 081 995	159,6	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
112	458 512	7 083 293	159,3	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
113	459 029	7 082 918	160,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
114	460 005	7 082 543	155,0	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
115	460 674	7 082 318	170,7	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
116	461 562	7 082 598	157,2	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER	Nordex N163/5.X Third octave sound power levels, revision 01	8,0	111,2
117	462 456	7 083 133	142,5	NORDEX N163/5.X 5700 163,0 IO...	Yes	NORDEX	N163/5.X-5 700	5 700	163,0	218,5	USER			

DECIBEL - Main Result

Calculation: Pilpangkangas VE3_14xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

...continued from previous page

Noise sensitive area

No.	Name	East	North	Z [m]	Immission height [m]	Demands		Sound level		Distance to noise demand [m]
						Noise [dB(A)]	From WTGs [dB(A)]			
I	Asuinrakennus I (Nuuttila)	471 499	7 084 904	165,2	4,0	40,0	35,3			1 099
J	Lomarakennus J (Ahmokangas)	470 723	7 085 089	155,0	4,0	40,0	34,7			1 606
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	4,0	40,0	36,7			850
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	4,0	40,0	36,0			1 051
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	4,0	40,0	36,3			913
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	4,0	40,0	33,5			1 939
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	4,0	40,0	33,5			1 784
P	Lomarakennus P (Kuiستila)	467 531	7 079 776	162,3	4,0	40,0	32,8			2 095
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	4,0	40,0	33,5			2 003
R	Lomarakennus R (Korpelanperä)	465 124	7 080 510	140,0	4,0	40,0	36,2			1 012
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	4,0	40,0	37,6			802
T	Lomarakennus T (Kärsämäenneva)	463 349	7 087 611	152,5	4,0	40,0	34,8			1 427

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	7696	7252	6460	8428	8978	9390	9565	13879	14077	13933	14345	14736	15254	17049	18423	19679	20446	19650	19773	14187
2	8356	7857	7262	6092	6469	6713	6784	10336	10732	10886	11824	12079	12589	14041	15652	17072	18232	17734	18145	14210
3	7300	6795	6048	6608	7119	7484	7624	11754	12034	12010	12653	12992	13515	15187	16678	18018	18968	18301	18558	13692
4	4774	4289	3504	5370	5924	6350	6537	10893	11042	10847	11195	11594	12110	13929	15273	16515	17276	16488	16629	11272
5	4963	4453	3751	4452	4995	5400	5569	9875	10076	9954	10450	10819	11341	13094	14515	15811	16683	15970	16191	11280
6	6185	5675	4974	5237	5750	6120	6265	10440	10701	10657	11282	11624	12147	13831	15312	16648	17596	16933	17199	12464
7	7234	6724	6034	5926	6405	6739	6862	10870	11181	11205	11938	12253	12775	14389	15919	17287	18304	17689	17998	13453
8	6862	6578	6558	2654	2443	2266	2149	4626	5033	5256	6380	6557	7043	8363	10005	11450	12717	12355	12895	10458
9	5265	4763	4162	3855	4369	4741	4889	9103	9346	9285	9900	10242	10765	12455	13931	15266	16221	15570	15852	11317
10	4050	3571	3101	2637	3184	3595	3771	8108	8285	8142	8637	9003	9525	11277	12698	14001	14898	14212	14469	9914
11	6278	5927	5777	2295	2359	2408	2398	5777	6136	6268	7249	7481	7986	9428	11034	12457	13646	13203	13677	10632
12	7576	7229	7074	3513	3464	3396	3322	5732	6193	6485	7664	7822	8299	9535	11201	12659	13967	13635	14190	11664
13	4640	4195	3403	5910	6460	6894	7090	11447	11559	11314	11559	11977	12485	14342	15629	16829	17512	16675	16762	11141
14	8811	8390	8052	5178	5290	5326	5294	7777	8272	8604	9804	9957	10429	11608	13289	14754	16090	15773	16330	13562
15	6437	6009	5672	3114	3392	3578	3627	7226	7586	7704	8632	8885	9395	10871	12467	13882	15039	14557	14992	11510
16	8559	8110	7697	5248	5451	5558	5561	8448	8911	9186	10307	10494	10981	12253	13916	15371	16655	16282	16795	13667
17	8506	8028	7524	5656	5949	6127	6164	9388	9823	10043	11083	11302	11801	13157	14799	16241	17471	17041	17508	13998
18	6842	6351	5801	4567	4978	5257	5349	9167	9511	9590	10430	10714	11231	12770	14340	15736	16833	16289	16665	12627
19	5403	4979	4665	2293	2678	2956	3056	7070	7355	7368	8143	8440	8960	10552	12091	13471	14539	13986	14365	10581
20	5627	5154	4685	3241	3687	4002	4118	8163	8451	8458	9202	9509	10031	11642	13171	14543	15584	15003	15352	11266
21	4509	4072	3736	2033	2539	2913	3065	7334	7549	7463	8075	8413	8936	10628	12101	13439	14413	13787	14102	9944
22	7410	6943	6479	4509	4822	5022	5073	8538	8933	9095	10064	10306	10813	12245	13861	15286	16468	15999	16439	12837
23	7580	7074	6436	5766	6202	6498	6599	10431	10779	10859	11685	11974	12492	14039	15607	17000	18082	17520	17876	13622
24	6211	5708	5098	4513	4988	5322	5446	9499	9793	9799	10520	10837	11359	12983	14505	15870	16888	16281	16602	12227
25	3665	3157	2537	3370	3924	4352	4543	8902	9041	8843	9220	9611	10129	11934	13298	14561	15375	14630	14826	9886
26	3693	3194	2430	4395	4945	5379	5576	9932	10045	9808	10091	10500	11012	12854	14167	15392	16128	15330	15465	10156
27	5589	5189	4419	7153	7704	8137	8333	12691	12800	12548	12765	13188	13694	15562	16828	18009	18652	17786	17837	12011
28	8922	8427	7653	8454	8962	9322	9459	13539	13838	13835	14498	14835	15358	17016	18518	19863	20816	20145	20392	15388
29	7741	7251	6471	7551	8078	8460	8611	12806	13065	13009	13587	13942	14465	16176	17636	18953	19850	19141	19356	14225
30	10007	9517	8737	9578	10081	10436	10569	14606	14919	14934	15620	15951	16474	18117	19630	20982	21947	21280	21530	16491
31	9944	9442	8681	9112	9593	9925	10045	13968	14308	14365	15125	15436	15958	17549	19095	20470	21492	20870	21162	16364
32	9269	8793	8002	9245	9770	10148	10297	14459	14733	14691	15283	15637	16160	17862	19330	20649	21544	20829	21032	15777
33	7944	7474	6681	8202	8741	9139	9301	13555	13789	13695	14201	14573	15094	16844	18268	19559	20398	19647	19819	14455
34	6972	6559	5779	8190	8744	9170	9356	13710	13862	13662	13967	14377	14889	16728	18043	19256	19948	19107	19182	13409
35	9674	9970	10688	9008	8567	8296	8224	6106	5482	4839	3409	3387	3054	3518	3057	3423	3595	2774	3160	5514
36	9753	10140	10916	10093	9737	9550	9525	8215	7595	6874	5349	5469	5247	5894	5223	5102	4424	3175	2715	4176
37	6278	6533	7225	5684	5306	5111	5087	4788	4278	3485	2261	2715	2983	4839	5572	6542	7073	6260	6476	4311
38	7910	8298	9076	8456	8143	8000	7999	7407	6820	6038	4530	4800	4752	5972	5825	6140	5886	4728	4477	2742
39	8055	8403	9159	8113	7753	7566	7543	6563	5964	5195	3668	3903	3824	5027	4957	5399	5360	4302	4261	3568
40	9358	9690	10433	9093	8687	8453	8403	6714	6091	5394	3891	3964	3712	4391	3931	4151	4009	2969	3048	4731
41	6524	6823	7549	6310	5957	5783	5770	5427	4891	4093	2739	3146	3317	5044	5560	6388	6745	5842	5963	3725
42	7284	7655	8425	7706	7393	7252	7253	6830	6260	5467	3996	4315	4336	5744	5814	6305	6250	5160	5029	2745
43	9024	9394	10161	9227	8866	8677	8651	7435	6821	6082	4549	4706	4529	5386	4951	5080	4702	3529	3300	3852
44	7195	7525	8270	7176	6825	6649	6633	5997	5426	4634	3163	3490	3536	5041	5284	5939	6110	5129	5169	3451
45	10229	10544	11276	9721	9287	9024	8955	6814	6192	5566	4152	4114	3758	3993	3221	3250	3078	2114	2418	5647
46	8092	8401	9130	7727	7329	7106	7063	5778	5172	4414	2881	3090	2999	4255	4343	4963	5180	4259	4418	4247
47	9012	9278	9972	8104	7650	7368	7290	5204	4580	3909	2454	2462	2181	3056	3093	3840	4352	3668	4117	5505
48	8112	8380	9077	7329	6897	6639	6577	4993	4382	3636	2102	2287	2198	3575	3904	4733	5224	4462	4793	4906
49	10798	10350	9932	7350	7480	7520	7486	9648	10186	10594	11868	11987	12441	13484	15185	16659	18064	17812	18407	15751
50	11328	10892	10507	7728	7811	7811	7759	9583	10143	10600	11928	12017	12454	13400	15106	16583	18032	17832	18463	16079

Project:

Pyhäntä_Pilpankangas

Licensed user:

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Calculated:

30.4.2024 15.41/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE3_14xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

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WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
52	11750	11336	11007	7956	7971	7918	7840	9206	9790	10304	11693	11743	12157	12979	14686	16160	17659	17524	18198	16183
53	9542	9137	8837	5743	5784	5761	5700	7685	8219	8625	9911	10022	10473	11523	13222	14695	16095	15846	16450	14034
54	10143	9748	9471	6256	6252	6192	6113	7719	8278	8738	10081	10160	10593	11540	13246	14722	16167	15971	16611	14455
55	8719	8347	8130	4737	4712	4645	4567	6525	7043	7428	8700	8817	9272	10364	12056	13527	14906	14642	15240	12909
56	8862	8566	8506	4659	4436	4216	4071	4962	5519	5992	7371	7425	7848	8790	10493	11969	13408	13223	13881	12201
57	10120	9863	9867	5915	5604	5311	5134	4671	5286	5913	7409	7363	7715	8330	10031	11499	13046	13005	13751	12843
58	9540	9291	9314	5343	5018	4718	4538	4265	4868	5455	6928	6908	7281	8004	9711	11185	12696	12609	13330	12263
59	9083	8868	8954	4942	4557	4214	4020	3462	4057	4631	6101	6084	6462	7238	8945	10421	11910	11800	12512	11504
60	9665	9451	9532	5522	5140	4796	4602	3662	4278	4913	6418	6361	6708	7339	9043	10514	12048	11998	12743	11986
61	8228	8122	8385	4519	3999	3570	3359	1539	2064	2566	4028	4017	4412	5375	7067	8539	9952	9776	10461	9667
62	8496	8335	8512	4526	4060	3663	3454	2417	2985	3518	4977	4970	5361	6246	7949	9424	10870	10718	11411	10460
63	9204	9034	9193	5190	4742	4354	4147	2677	3290	3923	5431	5370	5718	6401	8109	9583	11093	11019	11756	11110
64	9939	9777	9944	5944	5493	5101	4893	2830	3453	4169	5703	5579	5874	6325	8019	9482	11053	11067	11852	11613
65	12697	12469	12515	8525	8167	7834	7641	5829	6430	7198	8724	8537	8757	8779	10370	11756	13444	13655	14527	14754
66	13625	13455	13597	9583	9155	8774	8568	5768	6289	7087	8532	8250	8362	7974	9424	10717	12453	12820	13759	14865
67	13468	13327	13514	9518	9062	8664	8454	5311	5791	6585	7985	7676	7754	7261	8676	9951	11692	12085	13036	14379
68	13374	13259	13487	9524	9045	8634	8423	4980	5410	6192	7535	7200	7241	6636	8011	9265	11010	11431	12392	13970
69	14291	14166	14376	10394	9926	9521	9310	5937	6363	7142	8469	8123	8145	7434	8728	9921	11673	12162	13143	14913
70	15142	15000	15182	11181	10730	10335	10125	6890	7329	8111	9445	9100	9121	8373	9622	10775	12529	13058	14050	15888
71	16295	16164	16361	12368	11909	11509	11299	7907	8304	9069	10333	9960	9932	8996	10100	11146	12890	13518	14535	16795
72	15717	15567	15734	11726	11284	10893	10685	7514	7957	8740	10075	9729	9745	8971	10189	11316	13068	13624	14622	16517
73	15660	15539	15754	11774	11306	10900	10689	7216	7602	8364	9621	9247	9218	8298	9430	10503	12252	12855	13867	16083
74	14842	14738	14978	11023	10541	10128	9916	6317	6686	7441	8684	8307	8277	7378	8550	9663	11416	11982	12986	15146
75	14092	14000	14259	10330	9836	9418	9206	5515	5873	6625	7866	7491	7467	6618	7848	9011	10764	11284	12276	14328
76	14478	14415	14718	10850	10339	9912	9701	5762	6035	6739	7854	7443	7354	6282	7361	8432	10182	10783	11797	14294
77	15293	15223	15515	11624	11120	10695	10484	6592	6870	7574	8677	8261	8159	7017	8008	9006	10745	11406	12432	15108
78	15884	15811	16095	12192	11691	11268	11057	7193	7474	8177	9272	8853	8743	7559	8493	9441	11169	11869	12902	15696
79	16982	16860	17071	13085	12621	12217	12006	8514	8882	9633	10850	10460	10402	9356	10365	11338	13068	13756	14785	17309
80	19068	19014	19322	15443	14937	14511	14300	10317	10528	11176	12104	11651	11454	9965	10490	11093	12686	13610	14662	18385
81	21092	21010	21274	17332	16846	16429	16218	12402	12661	13339	14333	13888	13710	12259	12791	13368	14934	15885	16936	20657
82	21098	21047	21356	17473	16969	16544	16332	12342	12540	13174	14055	13594	13373	11803	12179	12636	14139	15145	16191	20266
83	21606	21544	21838	17932	17434	17012	16800	12865	13082	13730	14641	14184	13973	12427	12828	13298	14804	15807	16854	20881
84	20798	20728	21012	17094	16599	16179	15967	12074	12309	12971	13923	13472	13279	11786	12271	12816	14368	15332	16383	20211
85	20126	20060	20349	16439	15942	15520	15308	11396	11628	12289	13241	12791	12600	11118	11630	12205	13777	14722	15774	19535
86	20551	20458	20706	16749	16269	15856	15644	11900	12182	12877	13917	13481	13325	11936	12553	13199	14803	15714	16766	20283
87	7664	7445	7533	3519	3135	2803	2614	3464	3945	4305	5607	5702	6152	7283	8962	10427	11785	11525	12142	10433
88	8387	8136	8161	4187	3870	3582	3410	4020	4562	5017	6391	6447	6872	7858	9557	11031	12449	12249	12902	11337
89	7987	7712	7695	3776	3518	3281	3130	4434	4941	5326	6630	6726	7175	8269	9957	11425	12801	12549	13166	11271
90	13961	13764	13860	9848	9451	9090	8888	6413	6960	7757	9231	8970	9106	8788	10256	11556	13290	13645	14577	15500
91	14558	14373	14489	10473	10063	9693	9489	6788	7306	8104	9543	9254	9354	8891	10290	11542	13288	13706	14661	15884
92	8262	7935	7816	4117	3986	3843	3733	5451	5963	6346	7629	7738	8192	9288	10978	12448	13823	13563	14168	12034
93	24677	25149	25941	25852	25521	25347	25324	23431	22818	22237	20829	20788	20399	19971	18379	17042	15316	15126	14352	18166
94	24188	24652	25446	25212	24866	24678	24648	22626	22017	21455	20070	20011	19609	19113	17500	16142	14429	14296	13558	17682
95	23908	24379	25171	25056	24723	24547	24524	22629	22015	21433	20024	19984	19596	19175	17588	16257	14527	14327	13549	17397
96	19123	19511	20285	19072	18637	18365	18290	15515	14943	14509	13316	13139	12668	11769	10076	8626	7059	7347	6976	13104
97	18287	18665	19434	18133	17691	17414	17334	14517	13947	13520	12342	12157	11683	10766	9072	7623	6061	6384	6065	12373
98	17949	18340	19116	17964	17537	17274	17204	14551	13968	13504	12270	12113	11654	10857	9185	7767	6126	6295	5855	11921
99	18288	18691	19473	18458	18043	17792	17729	15190	14601	14114	12845	12709	12260	11534	9877	8476	6805	6884	6361	12144
100	16937	17340	18122	17140	16732	16488	16429	14008	13409	12895	11591	11475	11040	10423	8803	7455	5732	5667	5070	10812
101	16435	16851	17637	16824	16433	16207	16158	13940	13332	12780	11423	11342	10930	10461	8895	7616	5866	5613	4887	10210
102	15758	16188	16979	16375	16008	15805	15768	13814	13196	12600										

Project:

Pyhäntä_Pilpankangas

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Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

30.4.2024 15.41/3.6.377

DECIBEL - Main Result

Calculation: Pilpankangas VE3_14xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
123	12787	13281	14057	14723	14515	14455	14492	14094	13489	12728	11196	11392	11226	11881	10976	10405	9029	7914	6887	6401
124	22777	23227	24021	23559	23191	22982	22942	20742	20140	19603	18253	18169	17750	17167	15532	14151	12457	12398	11716	16313
125	22001	22444	23237	22679	22302	22087	22042	19778	19178	18651	17314	17221	16796	16184	14543	13156	11468	11434	10775	15568
126	21227	21667	22461	21873	21495	21277	21232	18971	18370	17840	16503	16410	15986	15386	13751	12370	10675	10626	9963	14810
127	20577	21011	21803	21143	20759	20536	20488	18183	17584	17061	15732	15633	15206	14589	12951	11569	9875	9840	9193	14193
128	20155	20579	21369	20582	20185	19952	19897	17488	16893	16388	15085	14969	14532	13856	12204	10806	9131	9156	8557	13834
129	19900	20313	21099	20166	19755	19508	19446	16906	16319	15838	14571	14434	13984	13229	11559	10140	8497	8609	8080	13664
130	19518	19918	20699	19622	19198	18938	18869	16207	15627	15170	13940	13783	13322	12492	10809	9373	7766	7965	7512	13384
131	18654	19067	19852	18942	18537	18295	18236	15781	15187	14686	13393	13271	12830	12152	10505	9116	7430	7453	6878	12430
132	19236	19658	20447	19643	19247	19014	18960	16579	15982	15469	14157	14047	13613	12971	11331	9949	8255	8240	7625	12939
133	19392	19828	20620	20006	19629	19414	19370	17168	16563	16019	14664	14582	14167	13634	12025	10680	8957	8828	8128	13002
134	16524	16971	17765	17384	17039	16855	16828	15039	14419	13802	12362	12350	11987	11776	10314	9149	7403	6904	6006	10084

Project:

Pyhäntä_Pilpankangas

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Calculated:
30.4.2024 15.41/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE3_14xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

8,0 m/s

Ground attenuation:

General, terrain specific

Ground factor for porous ground: 0,4

Area object with hard ground: Area object (Roughness): REGIONS_Pyhäntä_Pilpankangas_8.w2r (9)

Area type with hard ground: Järvet_lammet_Syke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Ignore pure tones setting on WTG

Height above ground level, when no value in NSA object:

4,0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0,0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Frequency dependent air absorption

63	125	250	500	1 000	2 000	4 000	8 000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,10	0,38	1,12	2,36	4,08	8,78	26,60	95,00

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: Siemens Gamesa SG 6.6-170 6600 170.0 !O!

Noise: (AM 0, 6.6MW) - 106dB(A) + 2dB(A)

Source Source/Date Creator Edited

SGRE 17.12.2021 USER 12.4.2024 10.51

Siemens Gamesa Renewable Energy and its affiliates reserve the right to change the above specifications without prior notice.

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	215,0	8,0	108,0	No	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
					88,5	95,4	98,1	99,9	103,8	101,9	95,3	85,0

WTG: Generic RD200 HH200 7200 200.0 !O!

Noise: V172 - 7,2 MW PO7200 STE + 2dB

Source Source/Date Creator Edited

Vestas 30.6.2022 USER 25.3.2024 10.00

DMS no.: 0128-4336_00

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	200,0	8,0	108,9	No	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
					92,4	100,0	103,3	103,5	101,9	97,4	89,9	79,2

WTG: NORDEX N163/6.X 6800 163.0 !O!

Noise: Nordex N163/6.X Third octave sound power levels, revision 02

Source Source/Date Creator Edited

Nordex 8.11.2021 USER 12.4.2024 11.00

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63	125	250	500	1000	2000	4000	8000
From Windcat	200,0	8,0	109,9	No	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
					93,8	98,6	101,7	103,2	104,8	103,0	91,5	71,3

Project:

Pyhäntä_Pilpankangas

Licensed user:

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Aarni Nikkola / aarni.nikkola@fcg.fi
Calculated:
30.4.2024 15.41/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE3_14xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

WTG: NORDEX N163/5.X 5700 163.0 !O!

Noise: Nordex N163/5.X Third octave sound power levels, revision 01

Source	Source/Date	Creator	Edited
Nordex	30.8.2019	USER	12.4.2024 10.58

Status	Hub height [m]	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
					63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	218,5	8,0	111,2	No	91,5	97,7	101,9	105,2	106,6	104,2	95,4	86,6

Noise sensitive area: A Asuinrakennus A (Nurmiaho)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: B Asuinrakennus B (Kivikangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: C Asuinrakennus C (Koukkula)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: D Asuinrakennus D (Konola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: E Asuinrakennus E (Piippo)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: F Asuinrakennus F (Pääkkö)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: G Lomarakennus G (Pääkkölä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE3_14xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

Noise sensitive area: H Asuinrakennus H (Peltola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: I Asuinrakennus I (Nuuttila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: J Lomarakenus J (Ahmokangas)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: K Asuinrakennus K (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: L Asuinrakennus L (Tuohipuro)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: M Asuinrakennus M (Pilpanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: N Asuinrakennus N (Hanhikaarto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: O Asuinrakennus O (Ketola)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: P Lomarakenus P (Kuistila)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Project:

Pyhäntä_Pilpankangas

Licensed user:

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Calculated:

30.4.2024 15.41/3.6.377

DECIBEL - Assumptions for noise calculation

Calculation: Pilpankangas VE3_14xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: Q Asuinrakennus Q (Hautalehto)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: R Lomarakenus R (Korpelanperä)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: S Asuinrakennus S (Myllymäki)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

Noise sensitive area: T Lomarakenus T (Kärsämäenneva)

Predefined calculation standard:

Immission height(a.g.l.): Use standard value from calculation model

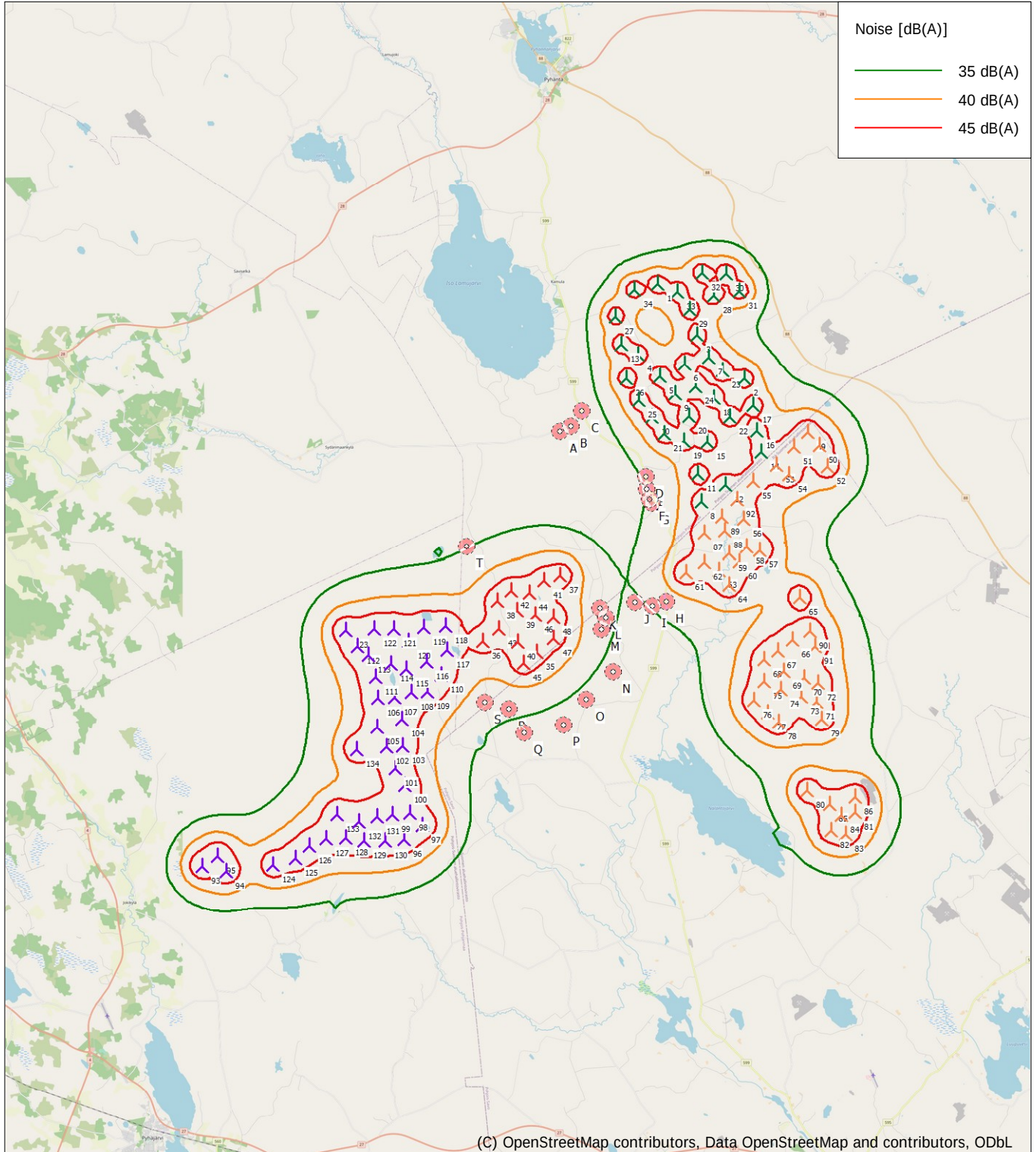
Uncertainty margin: Use default value from calculation model

Noise demand: 40,0 dB(A)

No distance demand

DECIBEL - Map 8,0 m/s

Calculation: Pilpankangas VE3_14xRD200xHH200_20231122_108.9dB_Yhteisvaikutusmallinnus

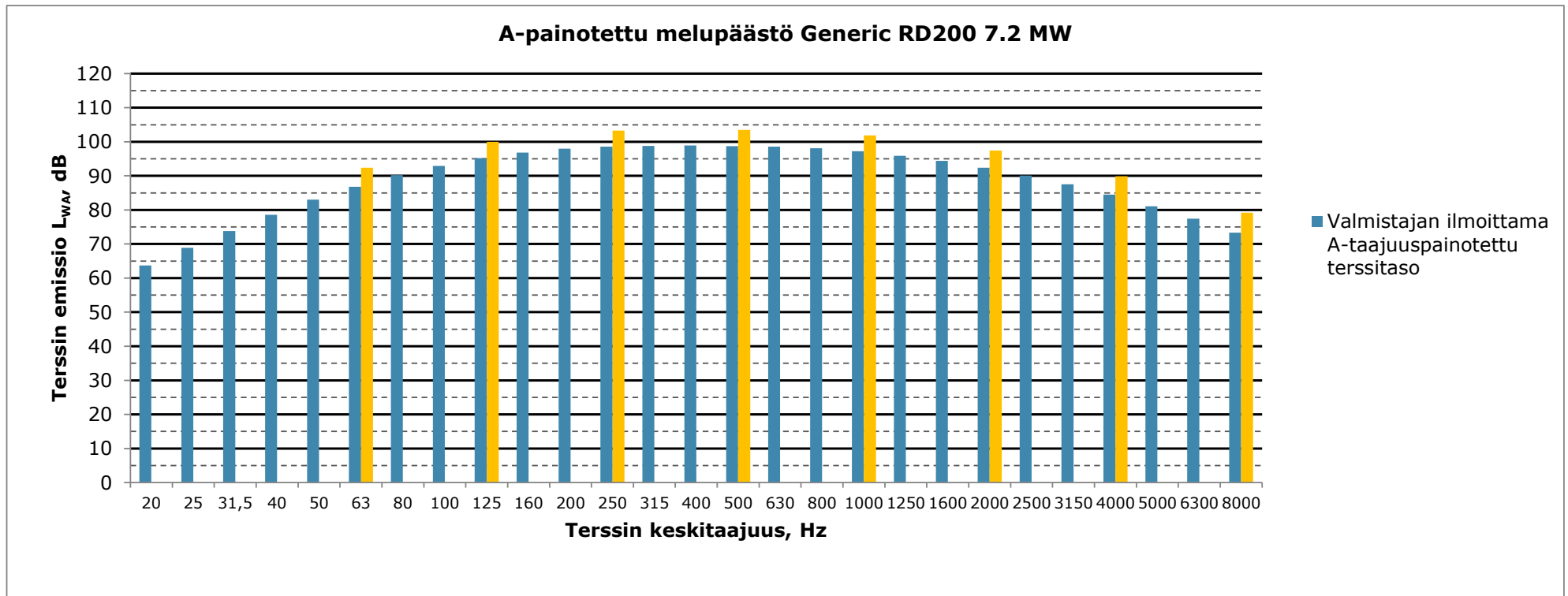


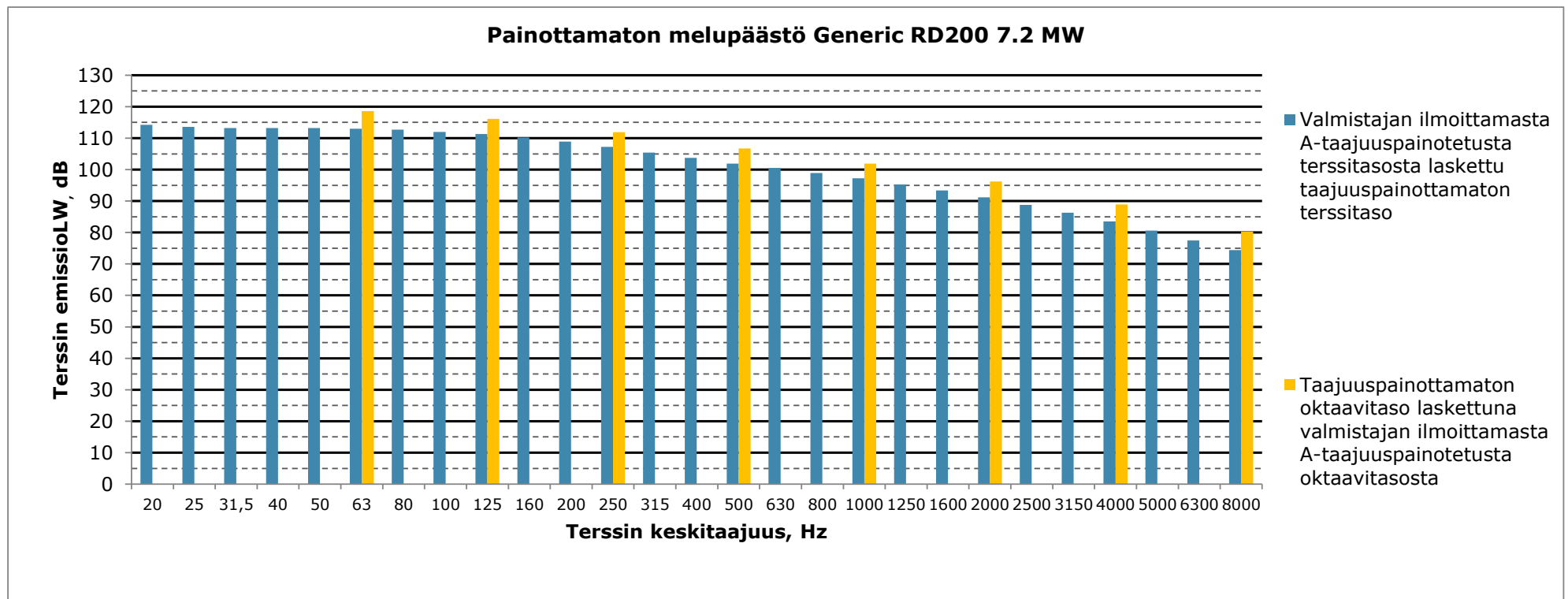
0 2,5 5 7,5 10km

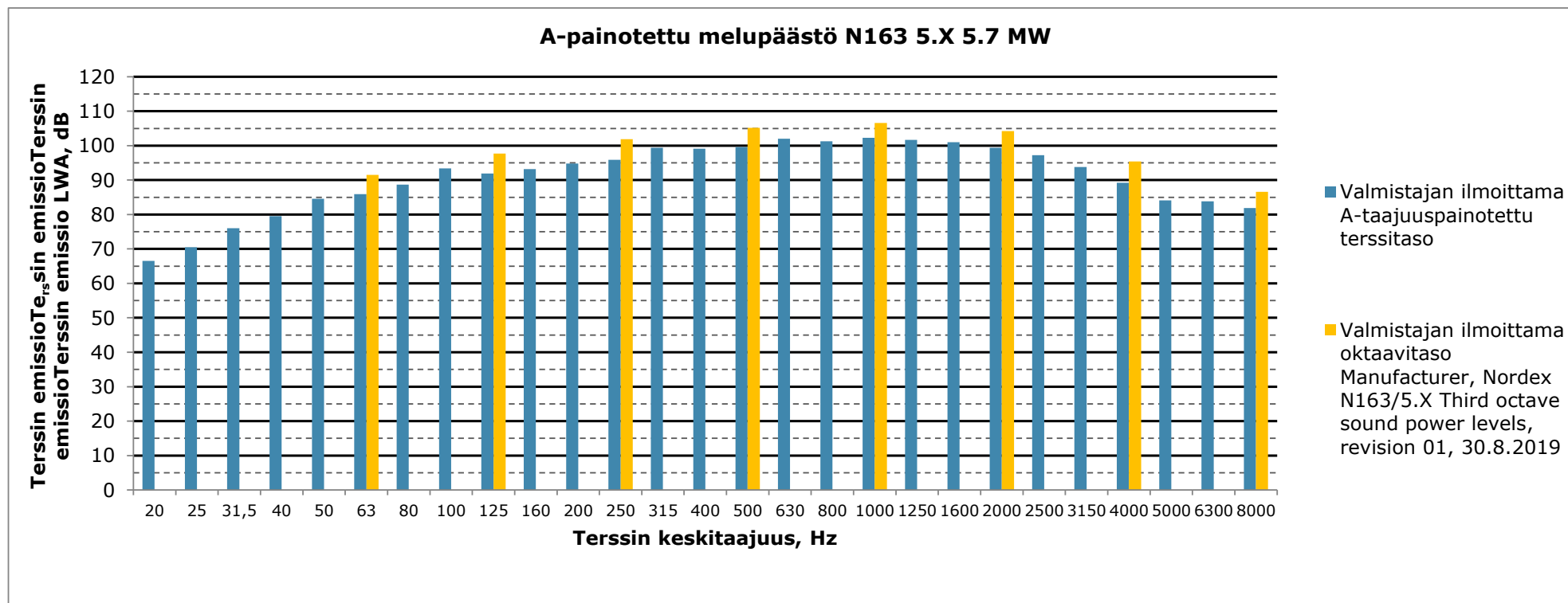
Map: EMD OpenStreetMap , Print scale 1:250 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 465 949 North: 7 086 500
New WTG Noise sensitive area
Noise calculation model: ISO 9613-2 General. Wind speed: 8,0 m/s
Height above sea level from active line object

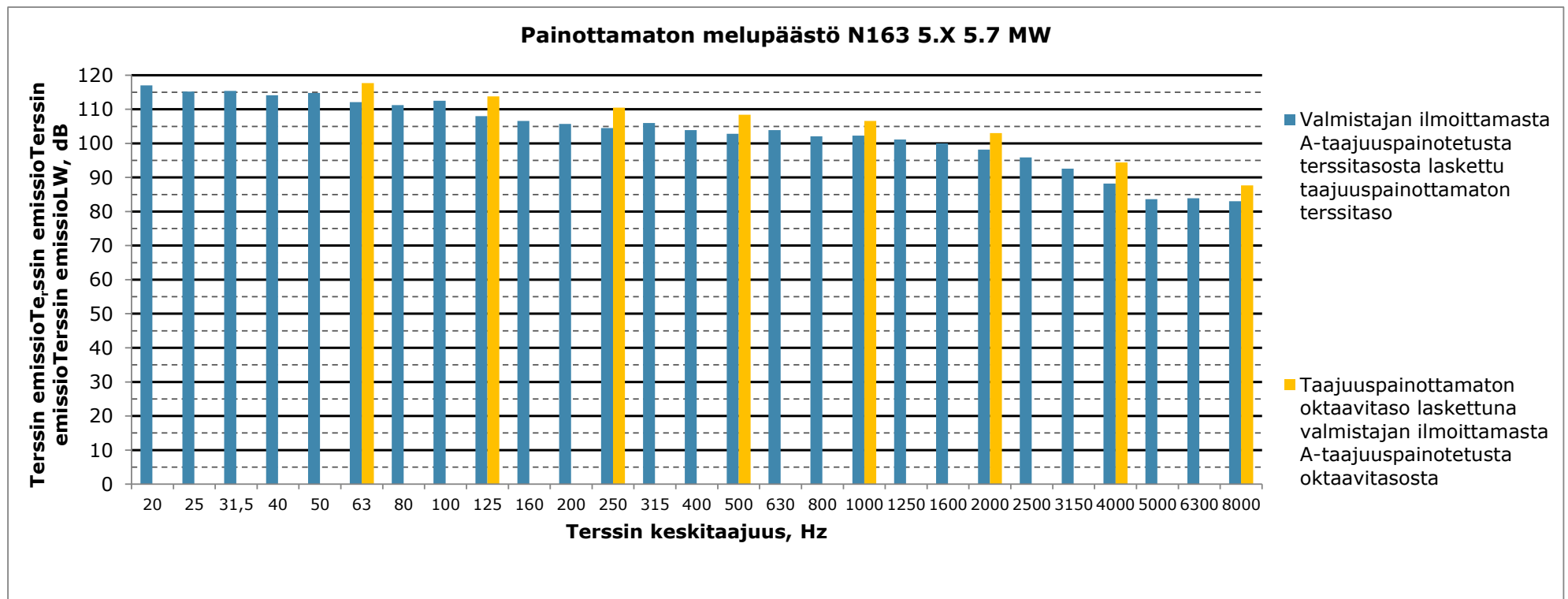
6.5.2024

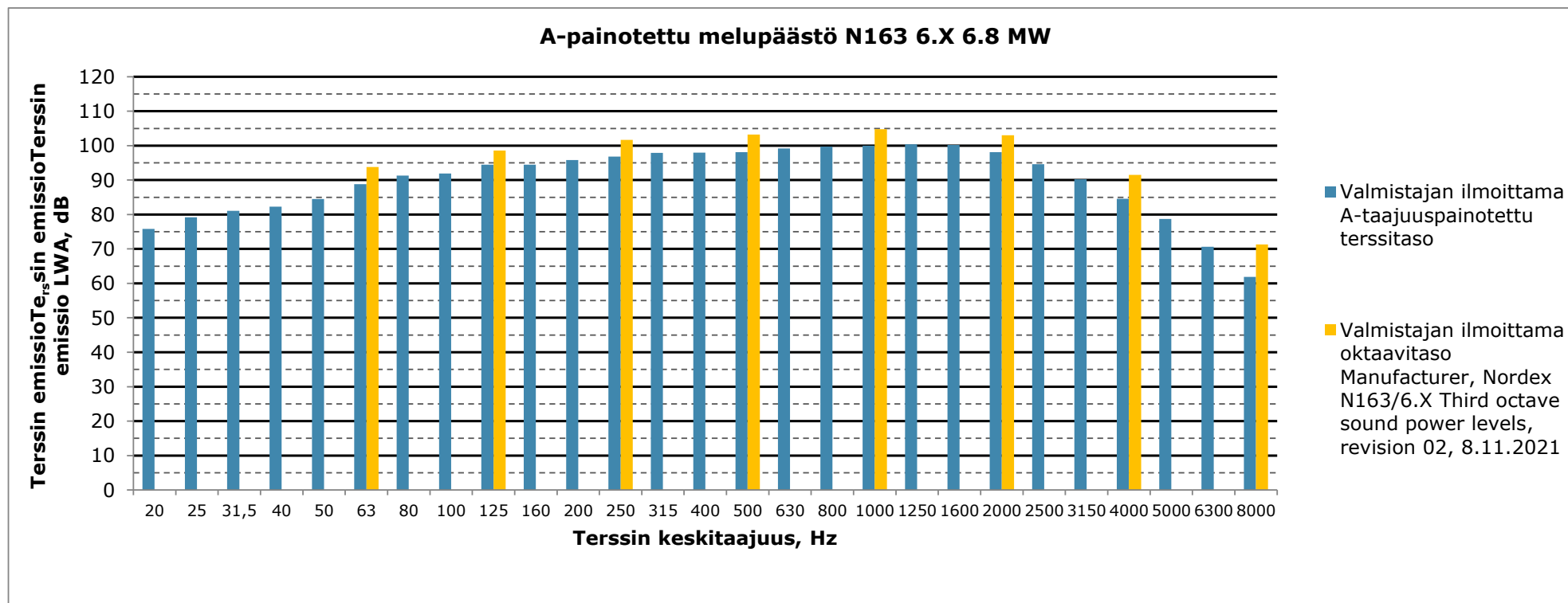
Liite 13. Matalataajuisen melun yhteisvaikutuksen rakennuskohtaiset arvot – Hankevaihtoehto 1 (VE1).

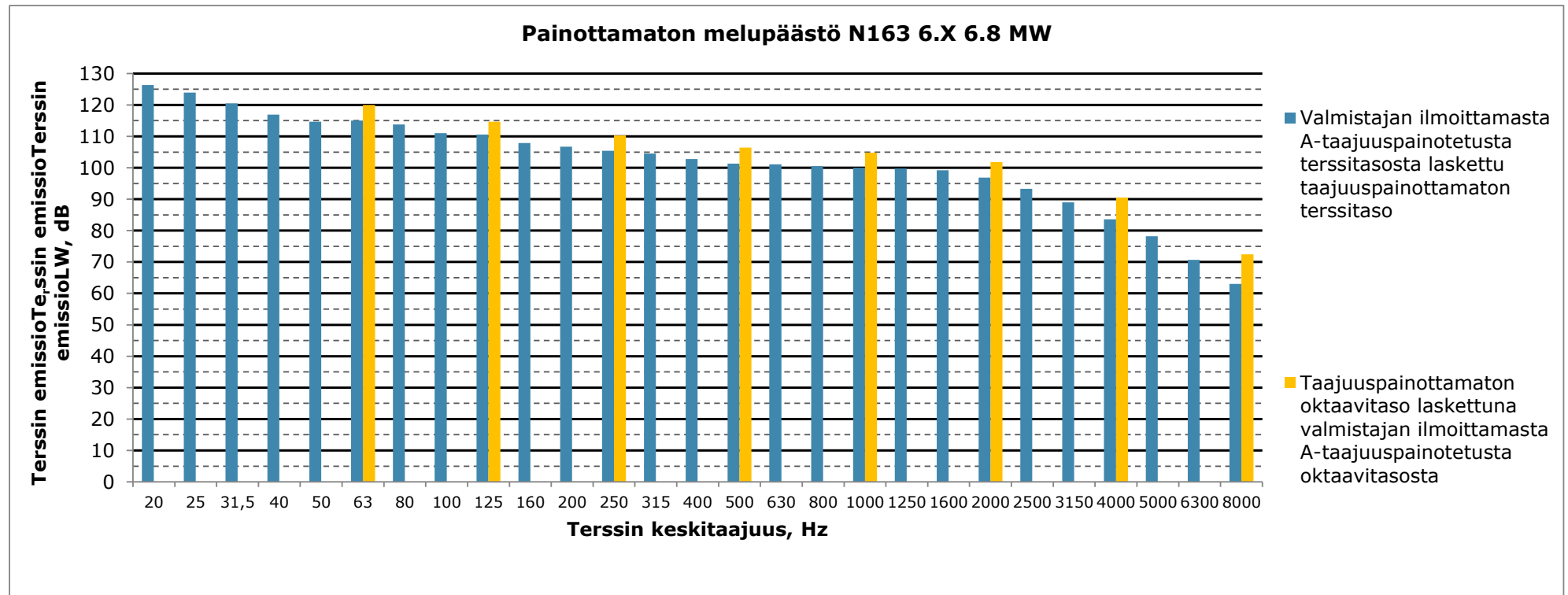


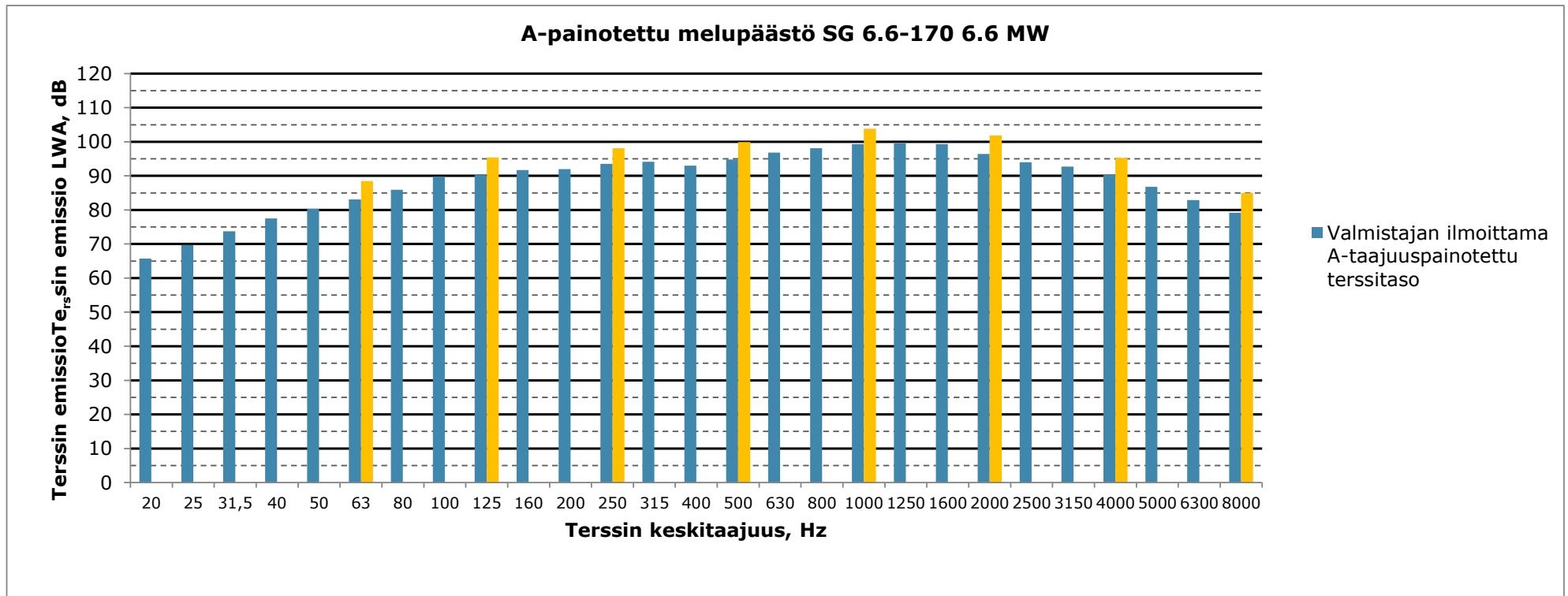


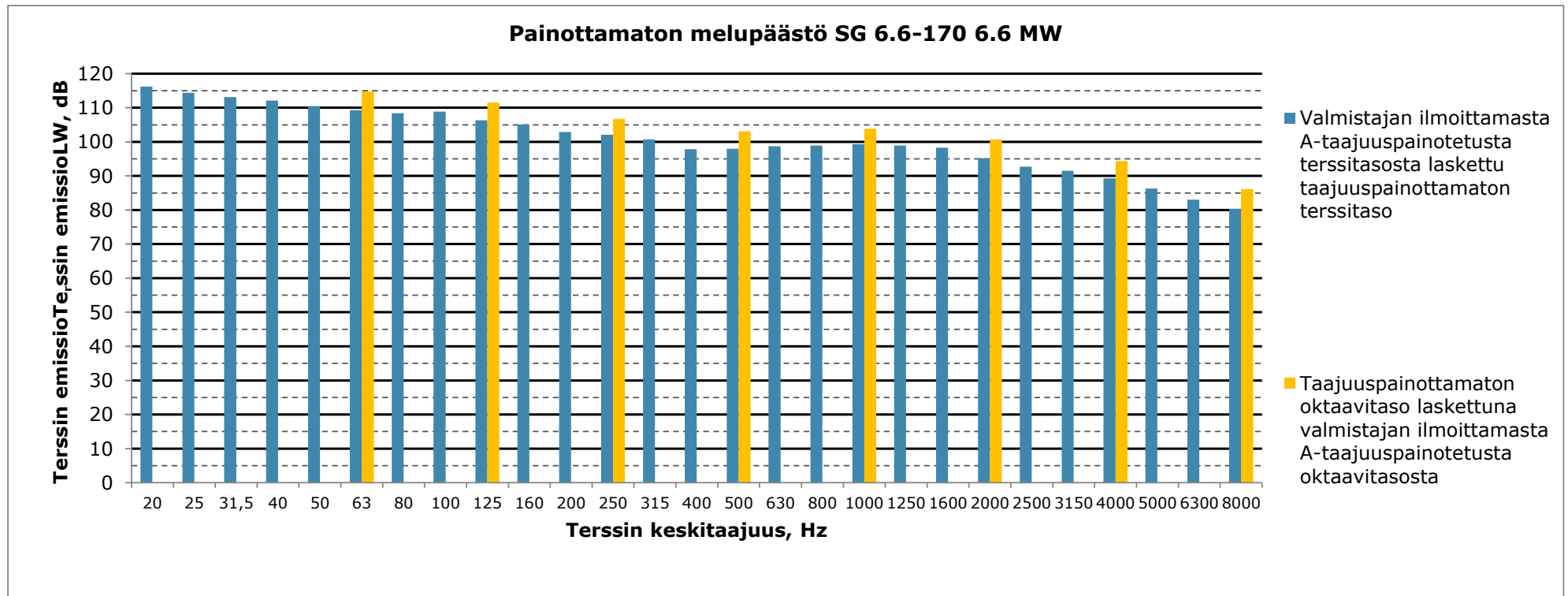


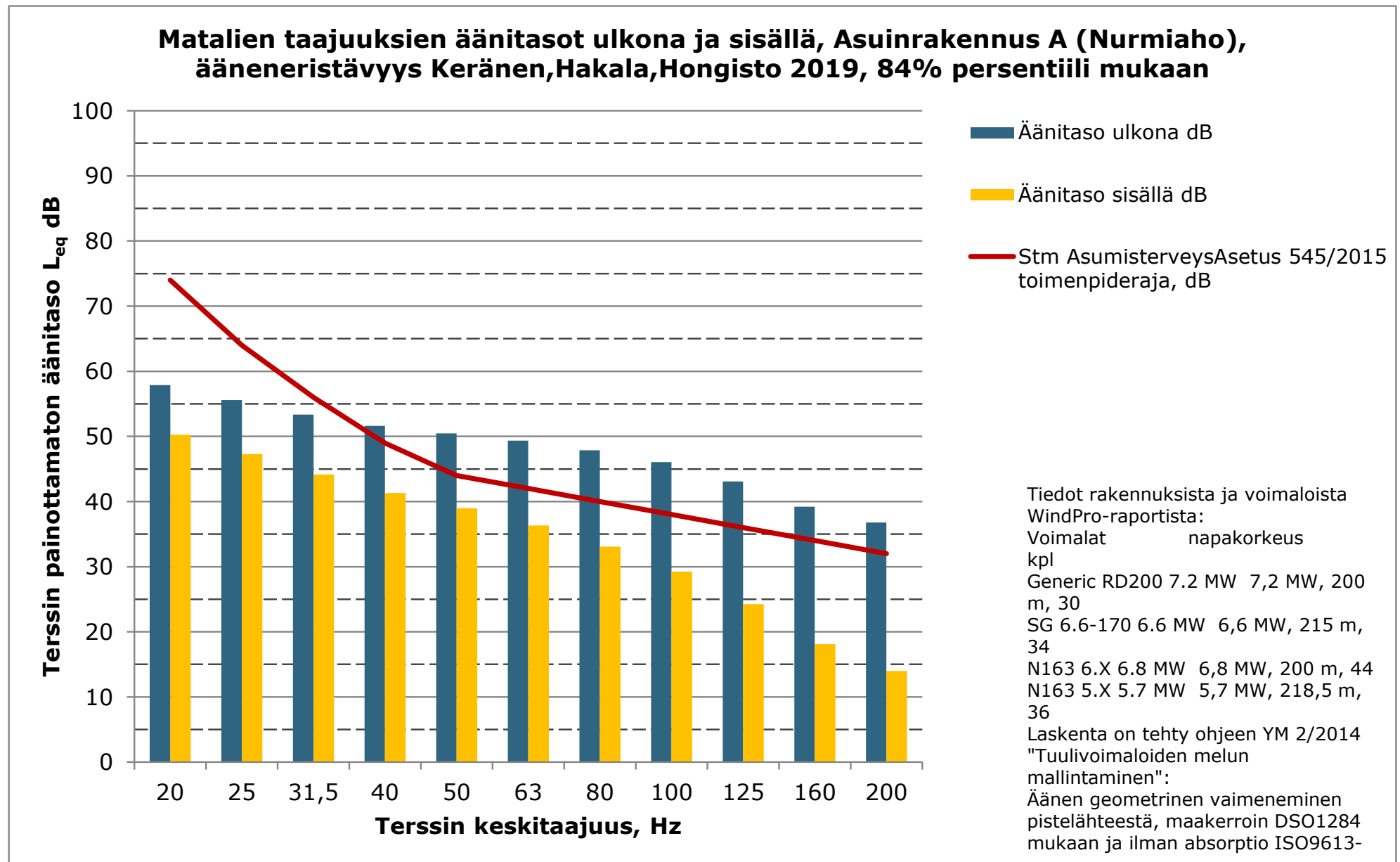




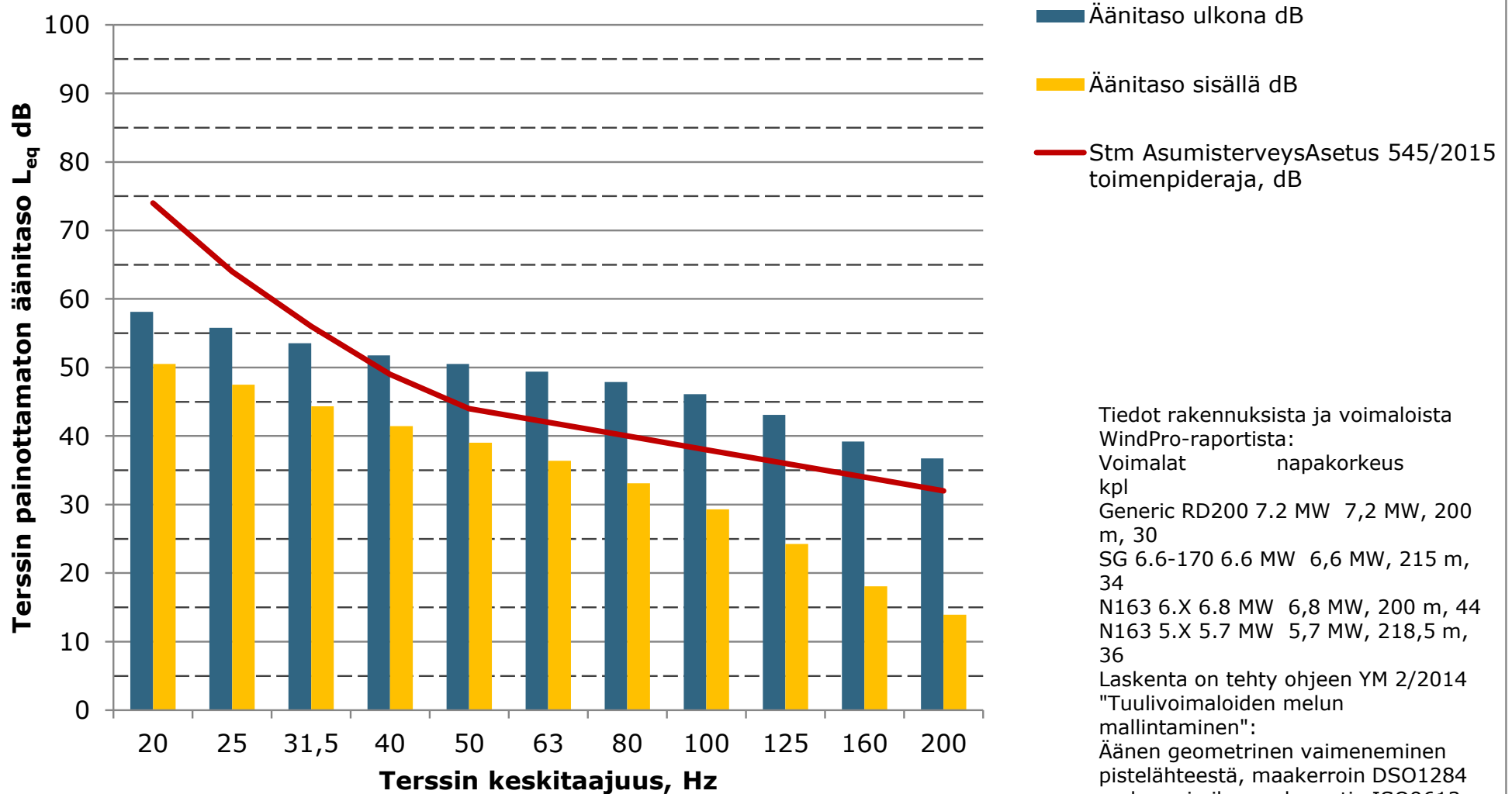


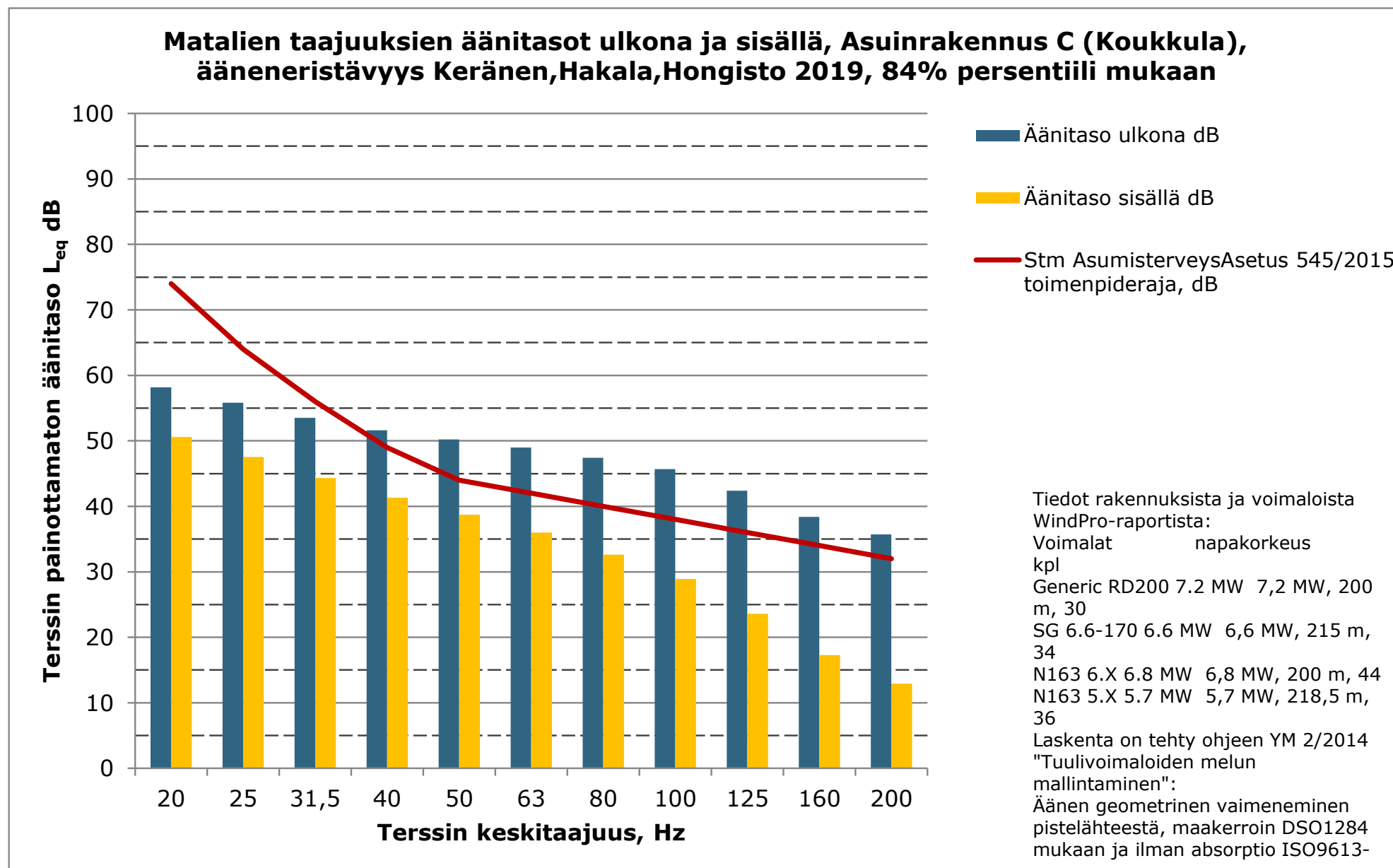




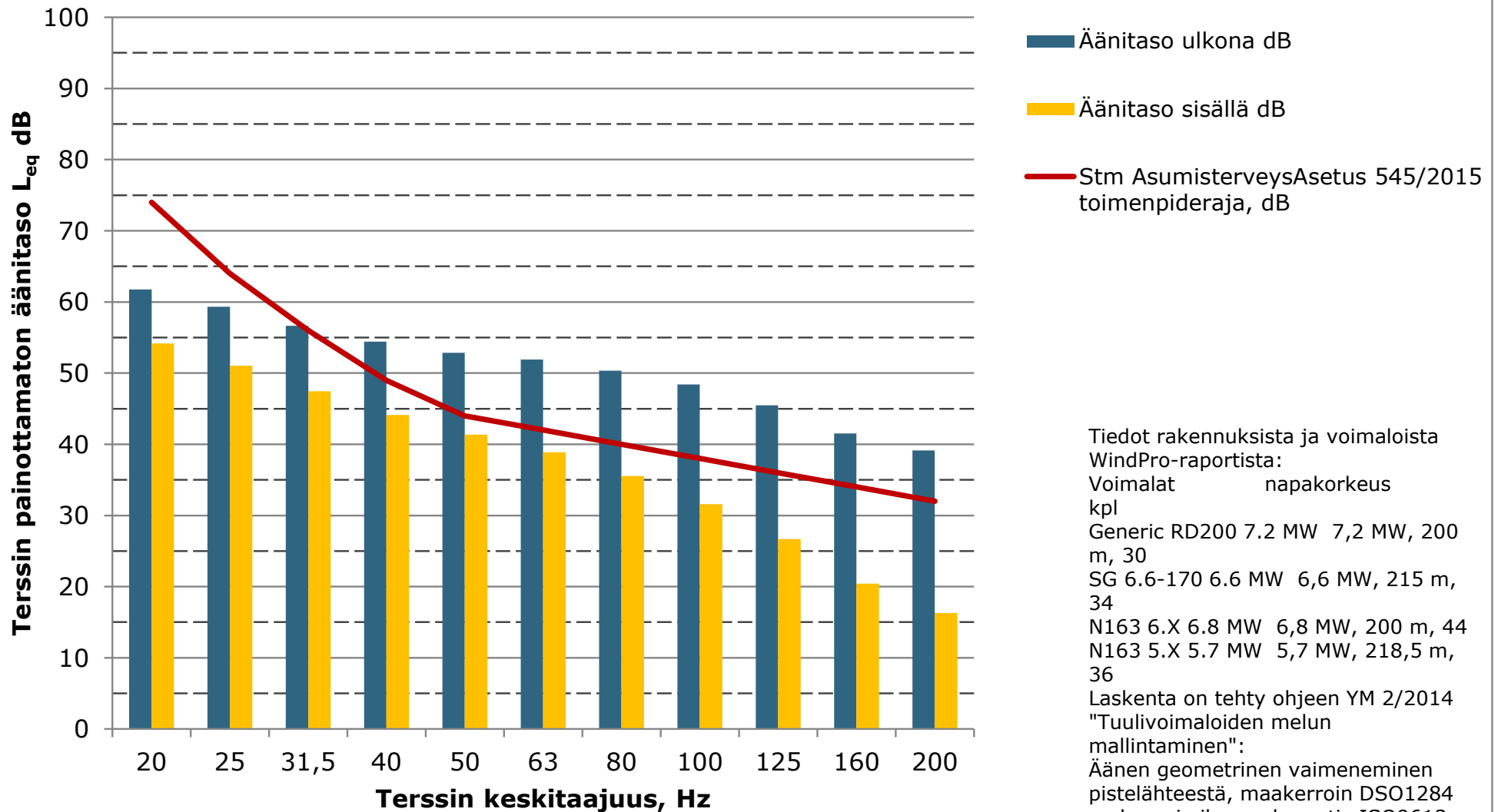


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus B
(Kivikangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**

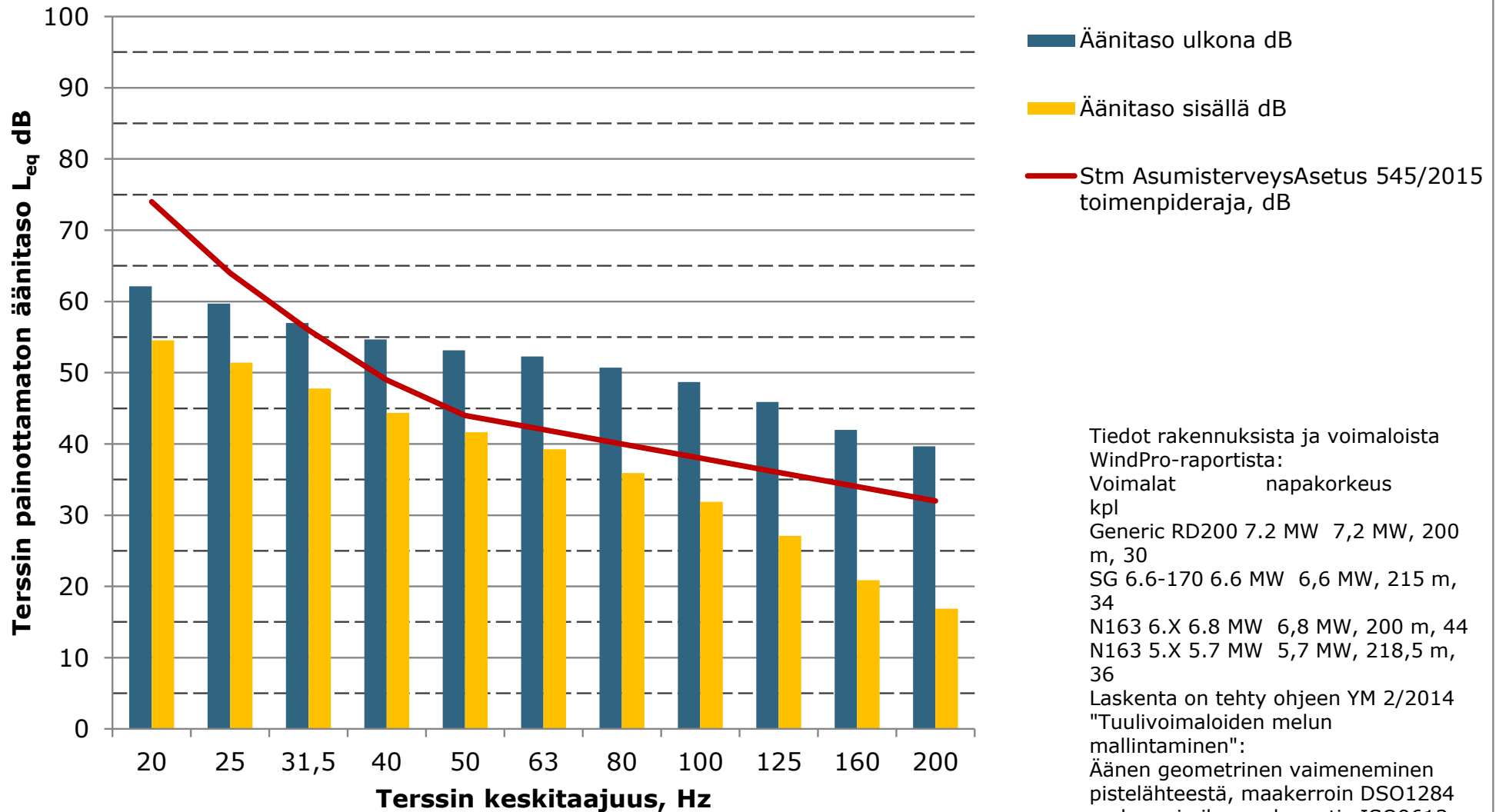




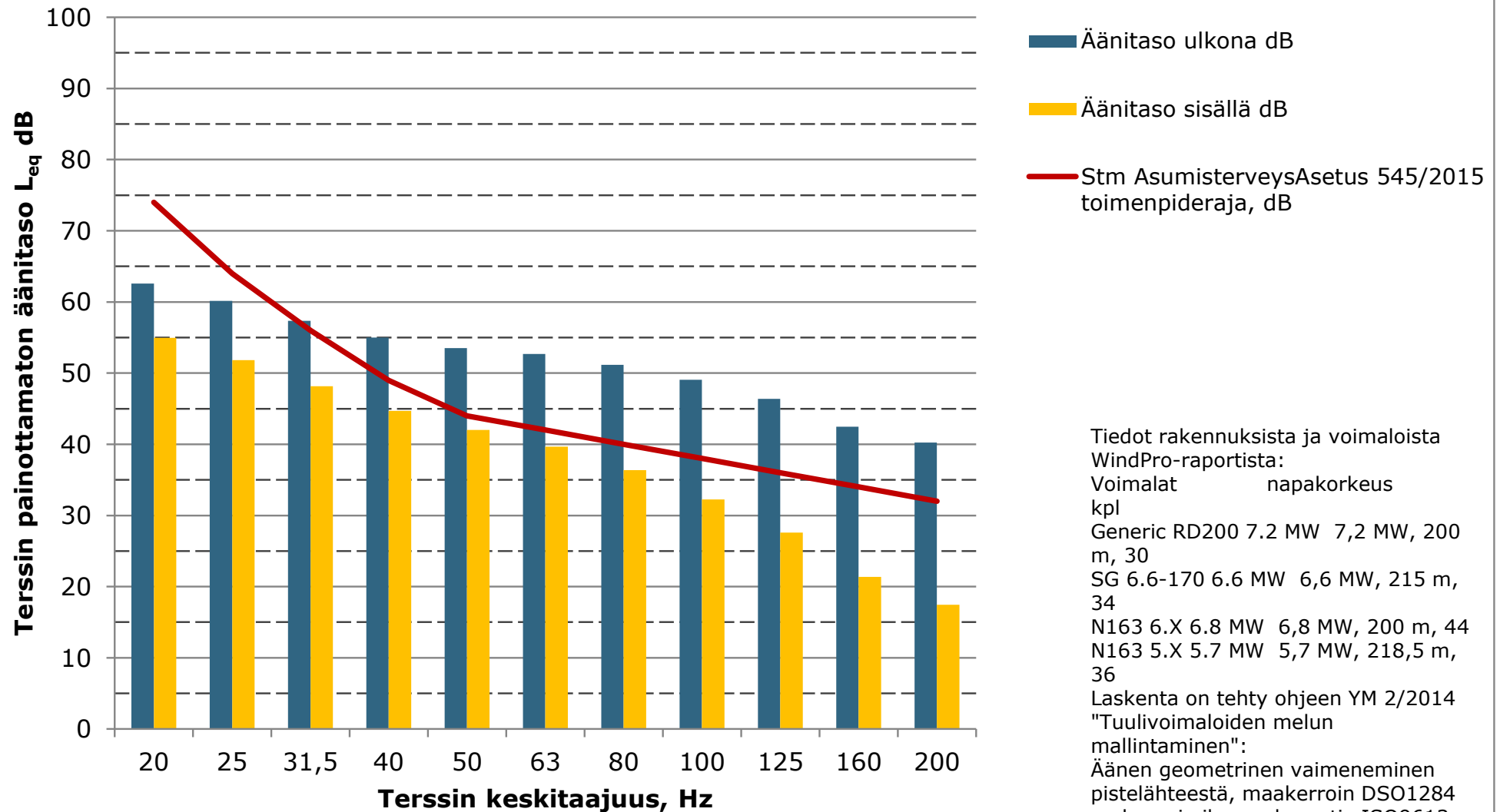
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus D (Konola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



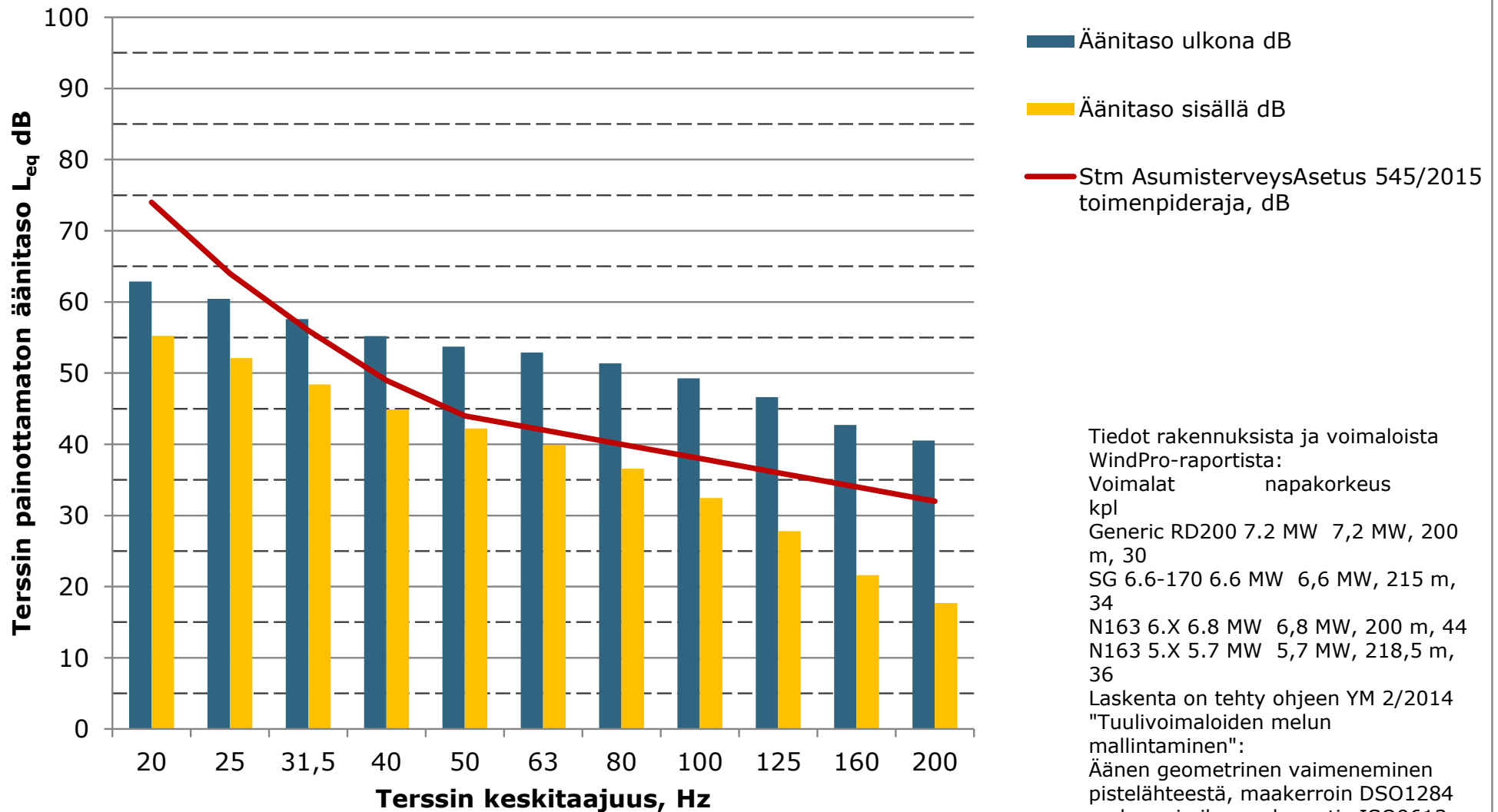
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus E (Piippo), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



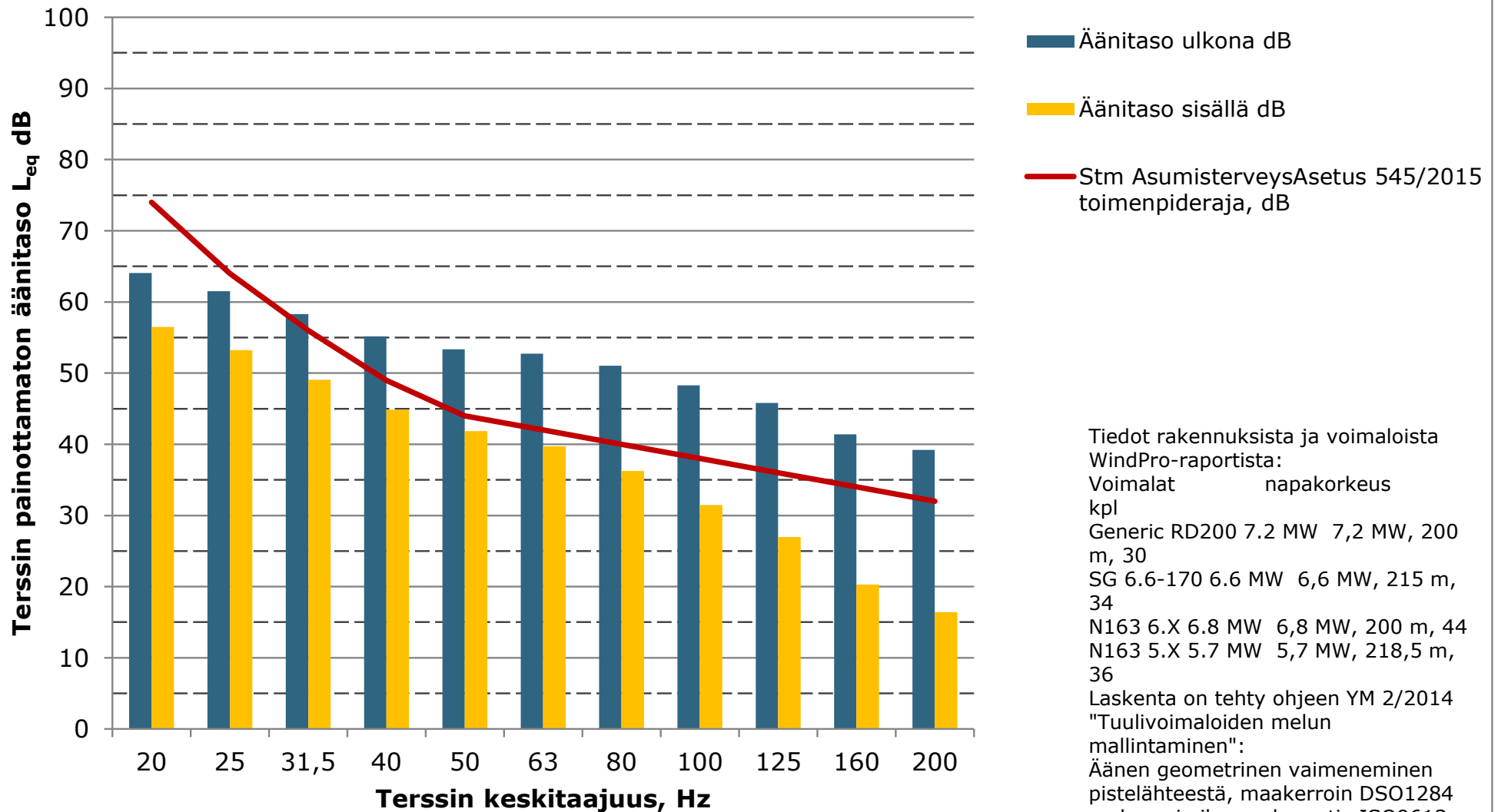
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Pääkkö), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



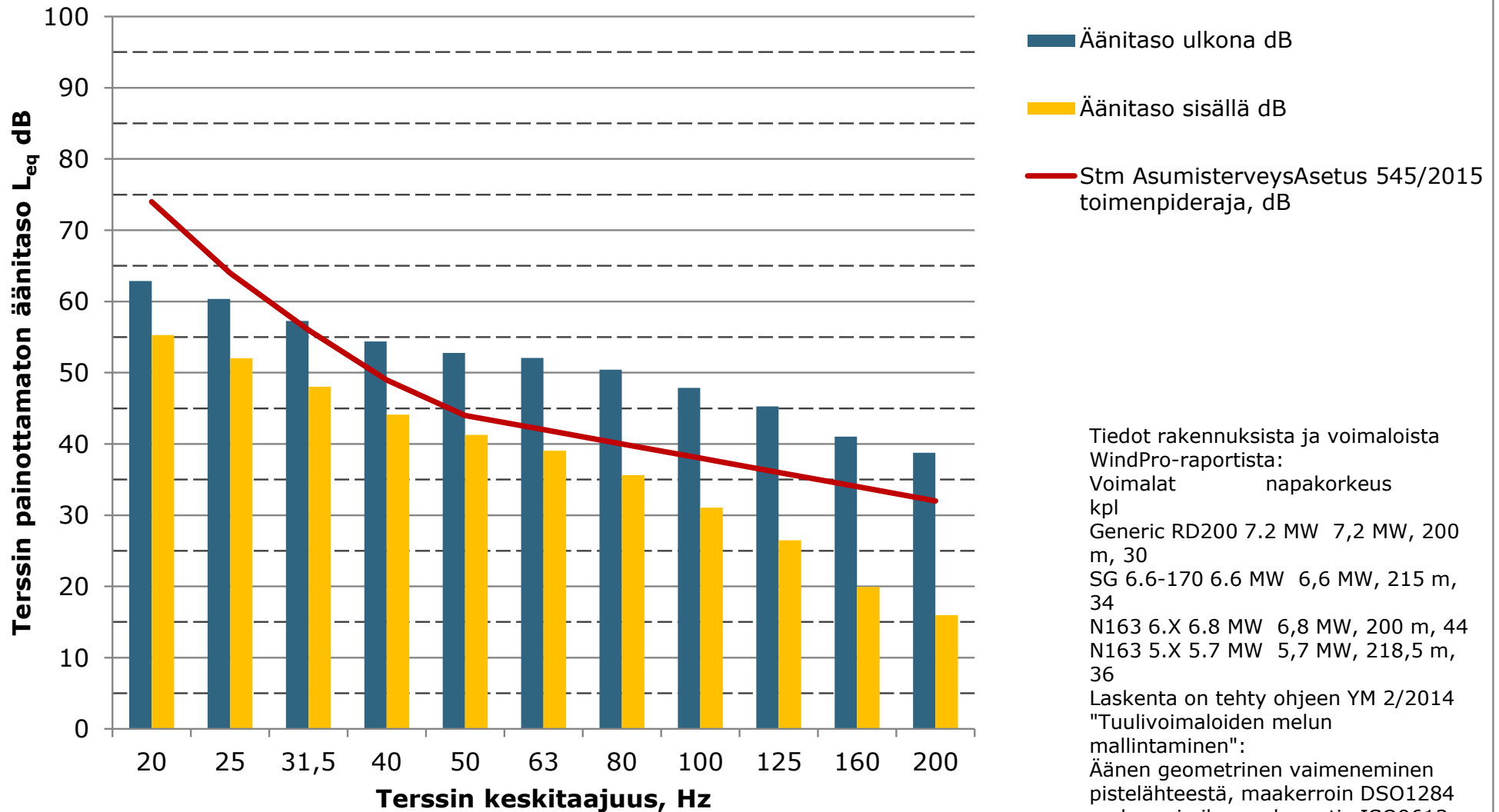
Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakenus G (Pääkkölä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



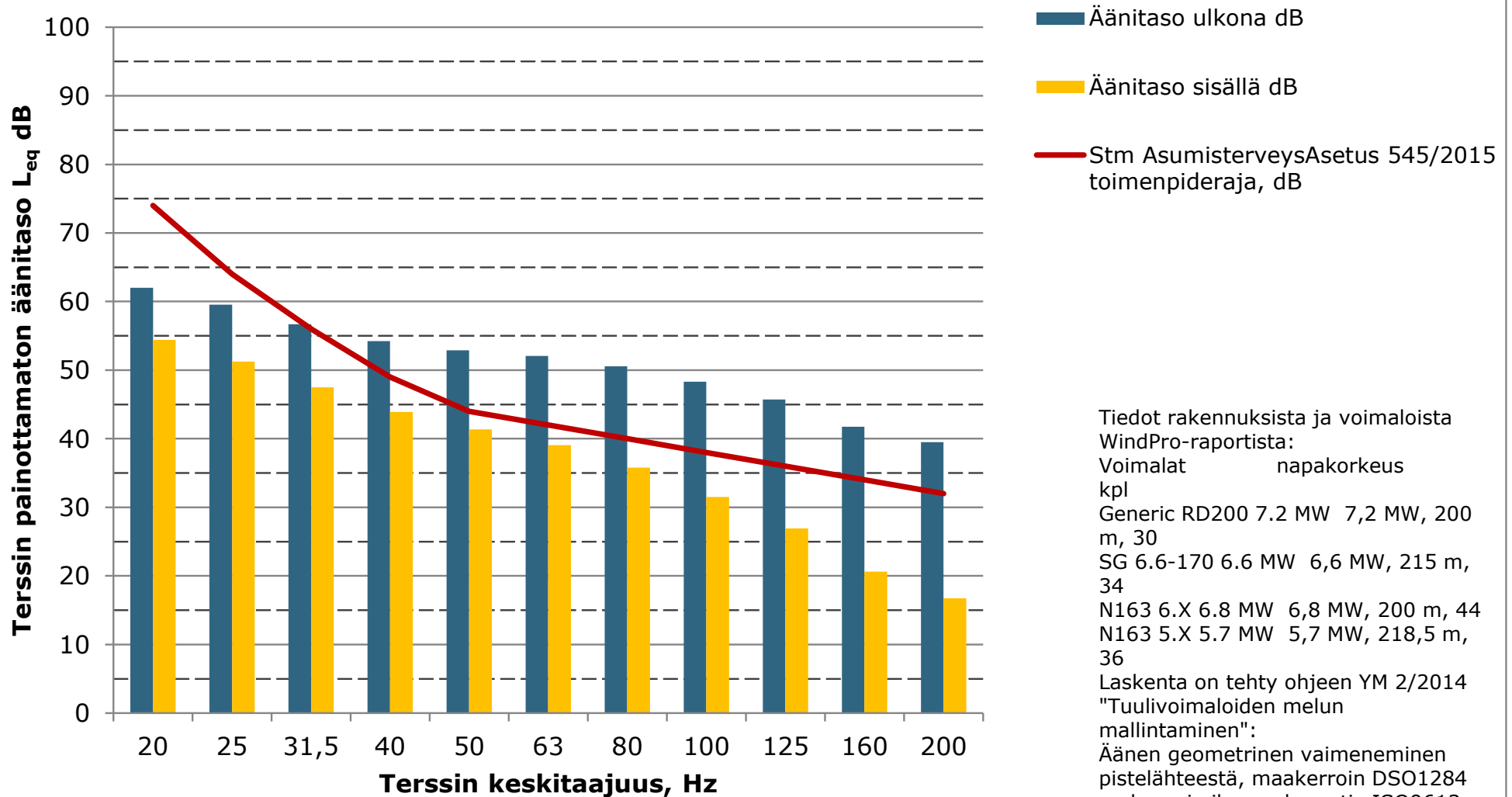
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Peltola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



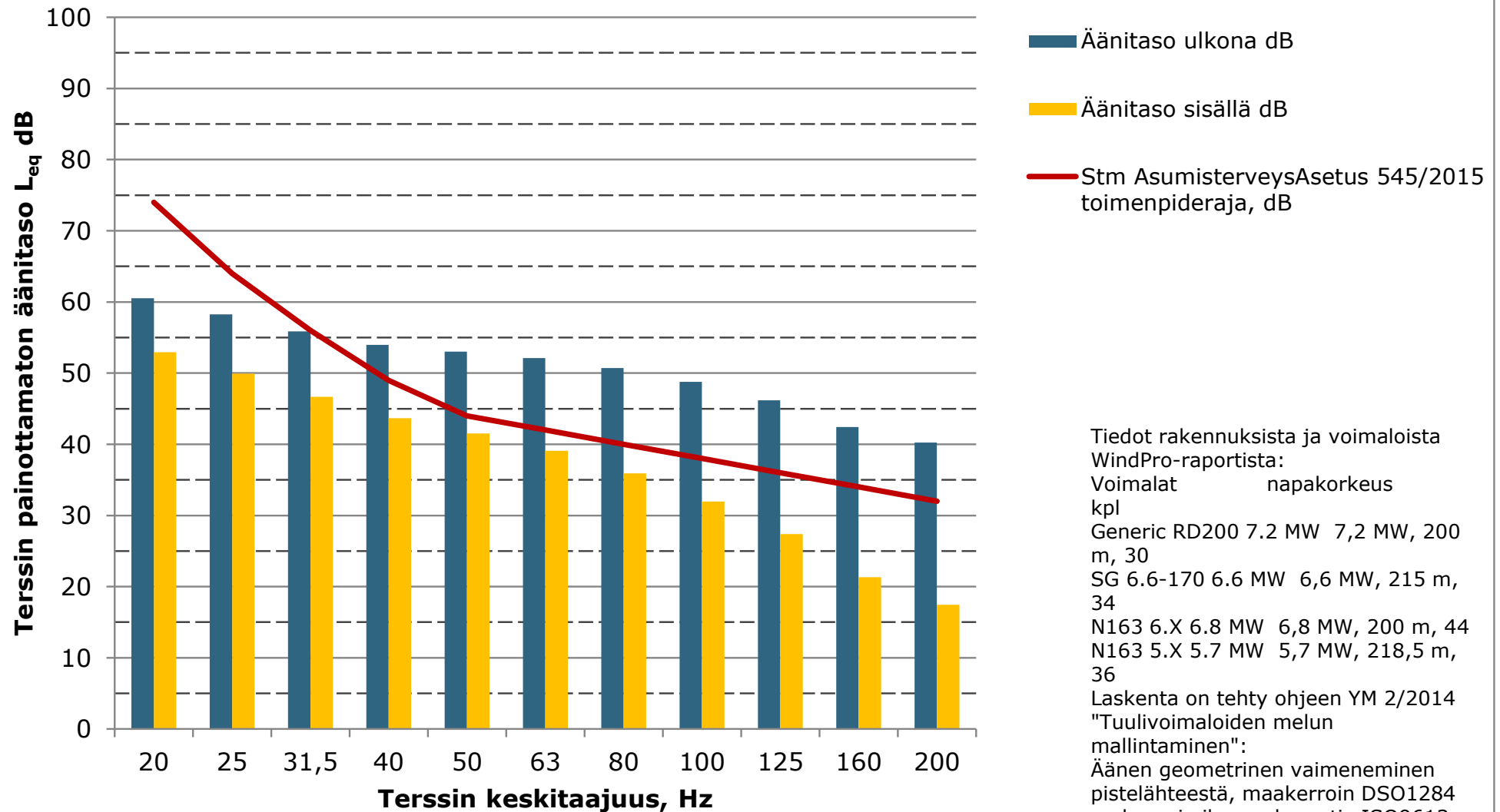
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus I (Nuuttila), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



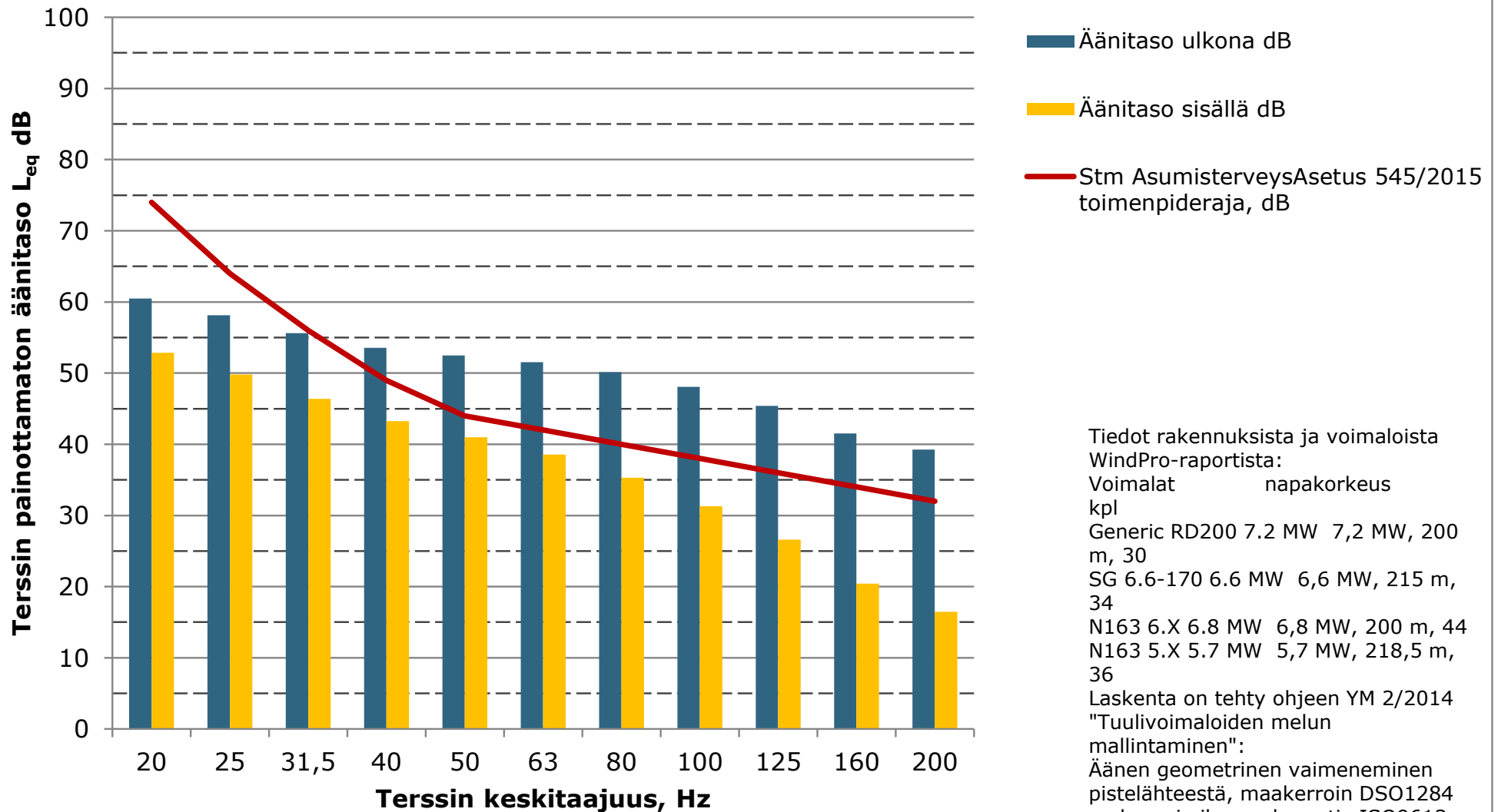
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakenus J
(Ahmokangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



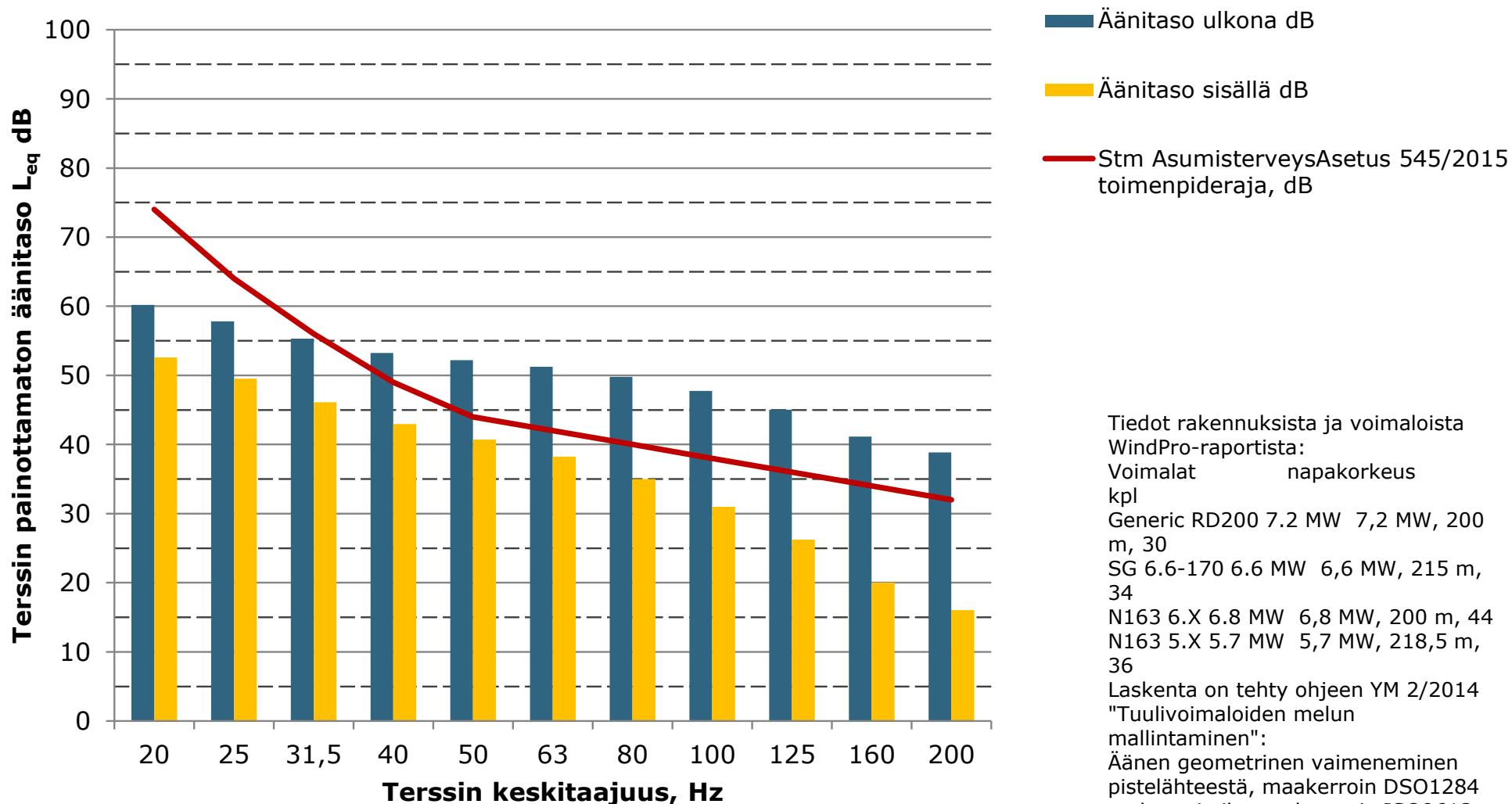
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Ketola),
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



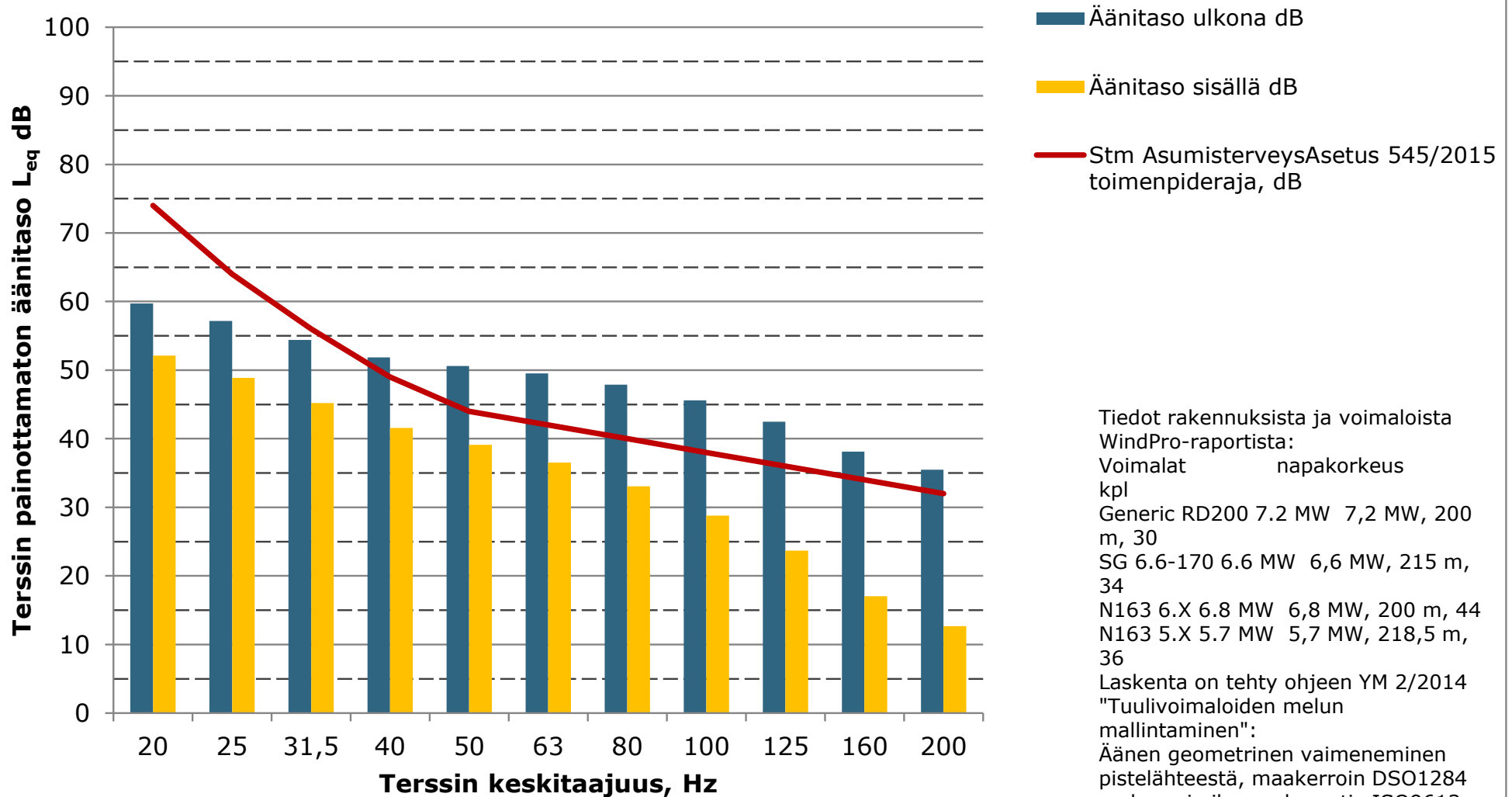
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus L (Tuohipuro), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



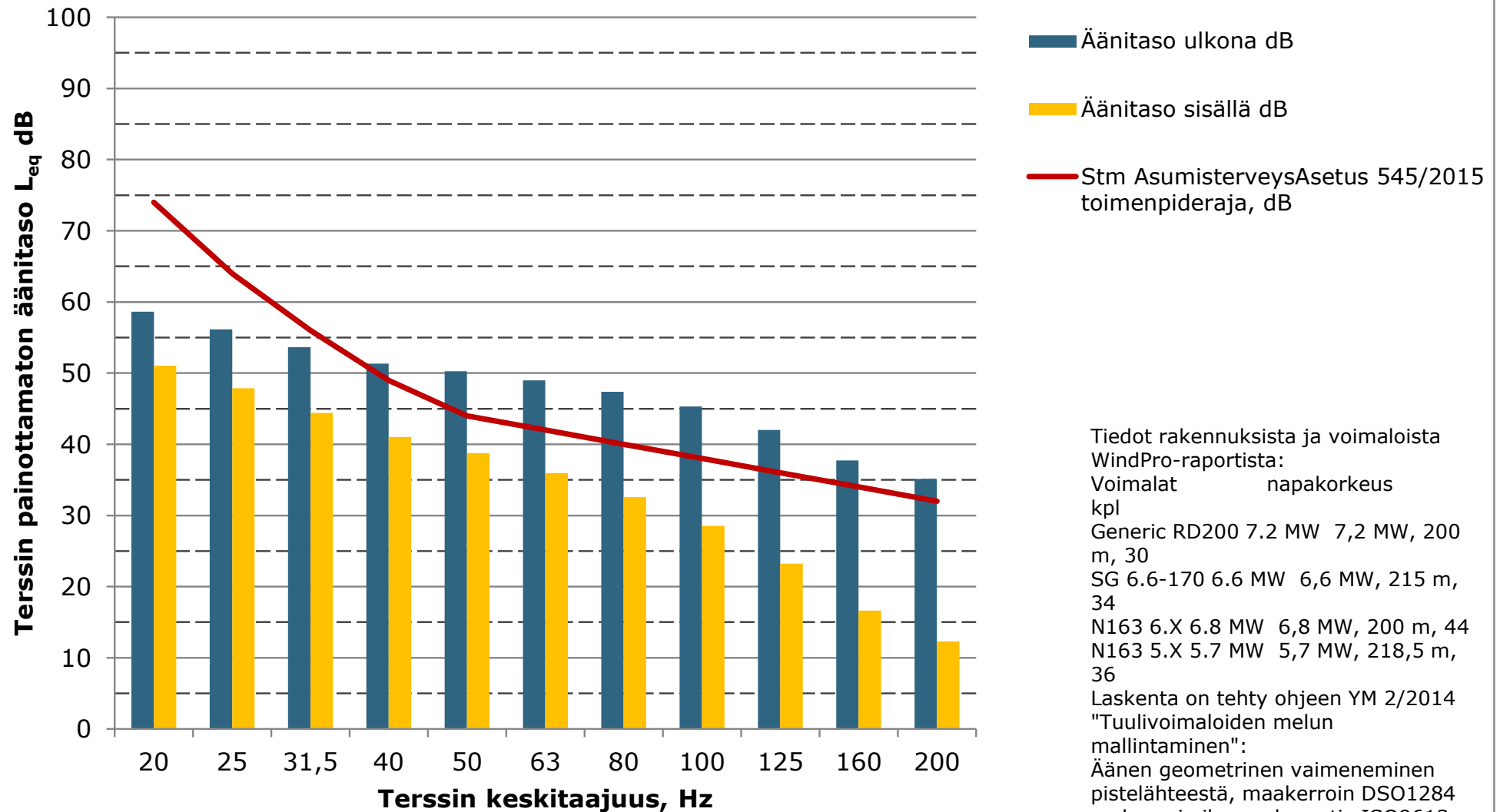
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus M
(Pilpanperä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**



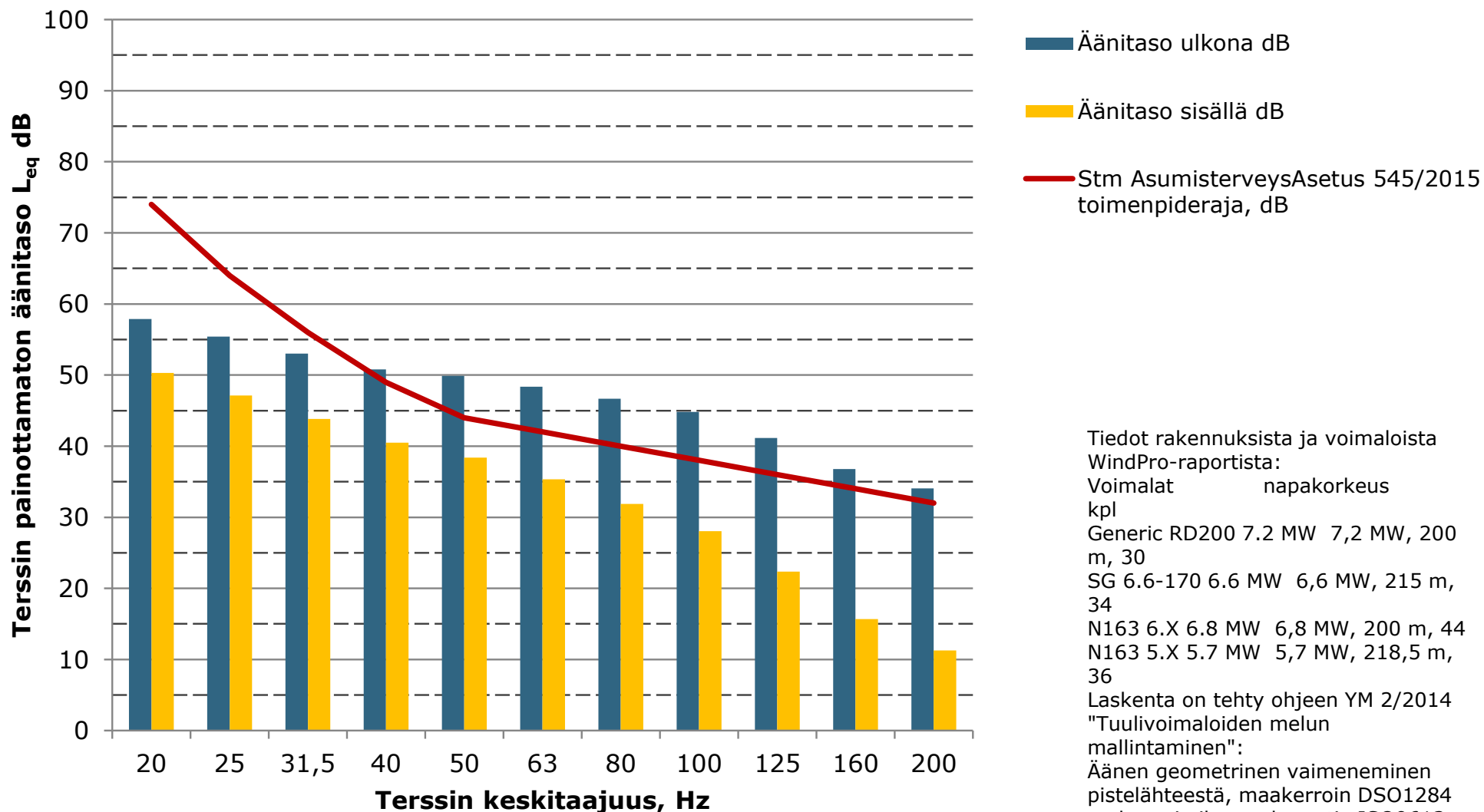
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus N
(Hanhikaarto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



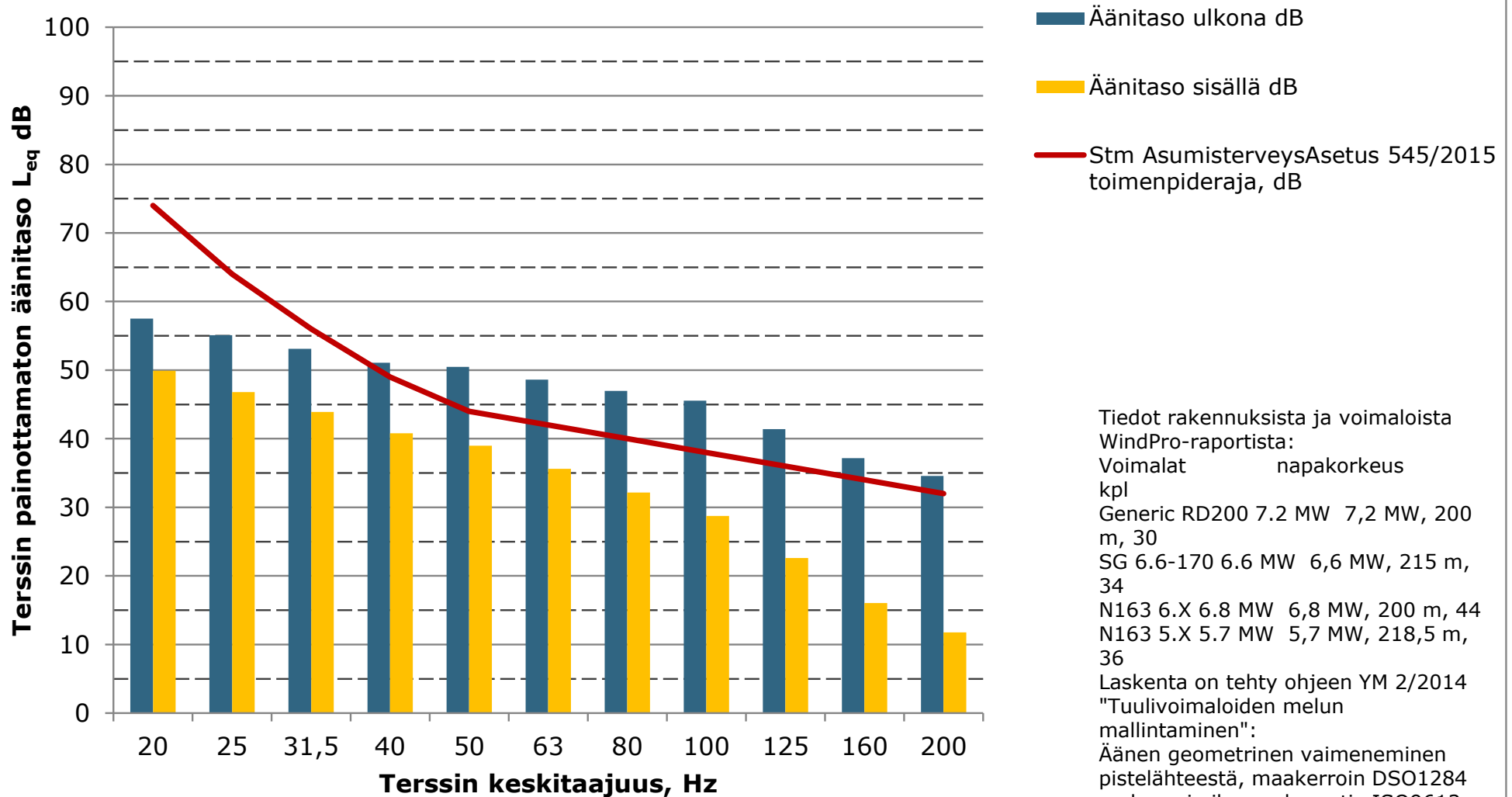
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus O (Ketola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



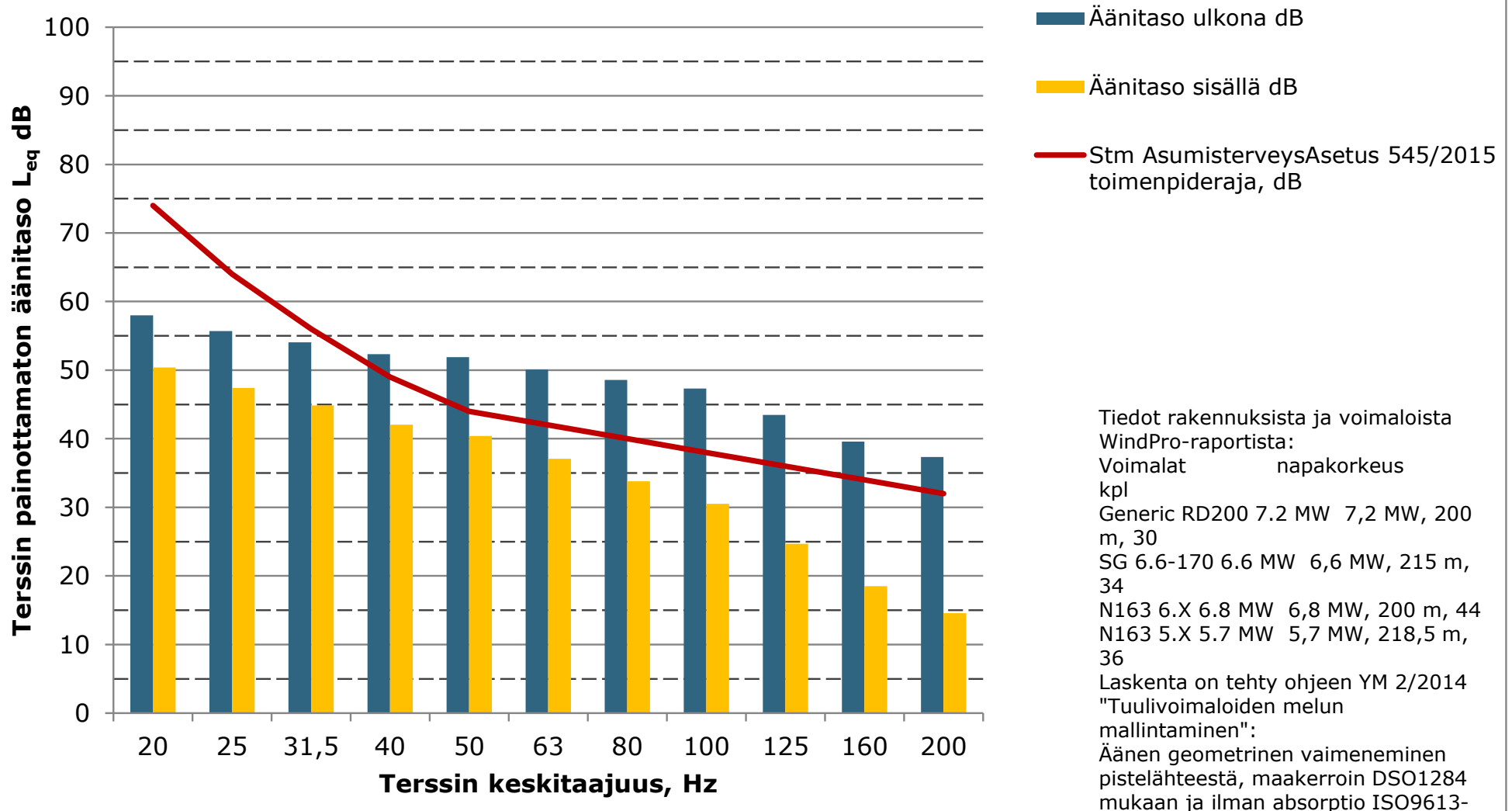
Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus P (Kuistila), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

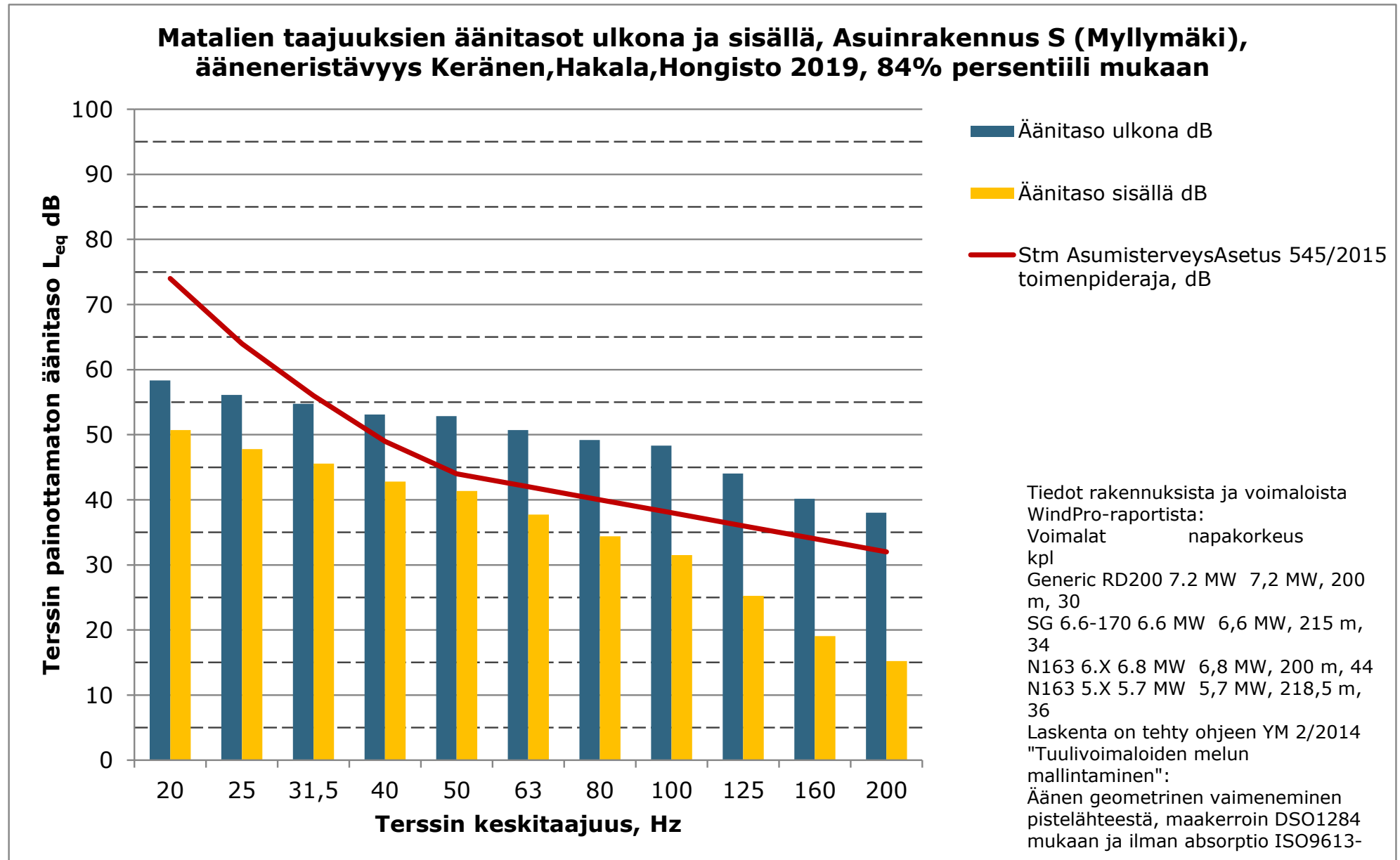


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus Q
(Hautalehto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**

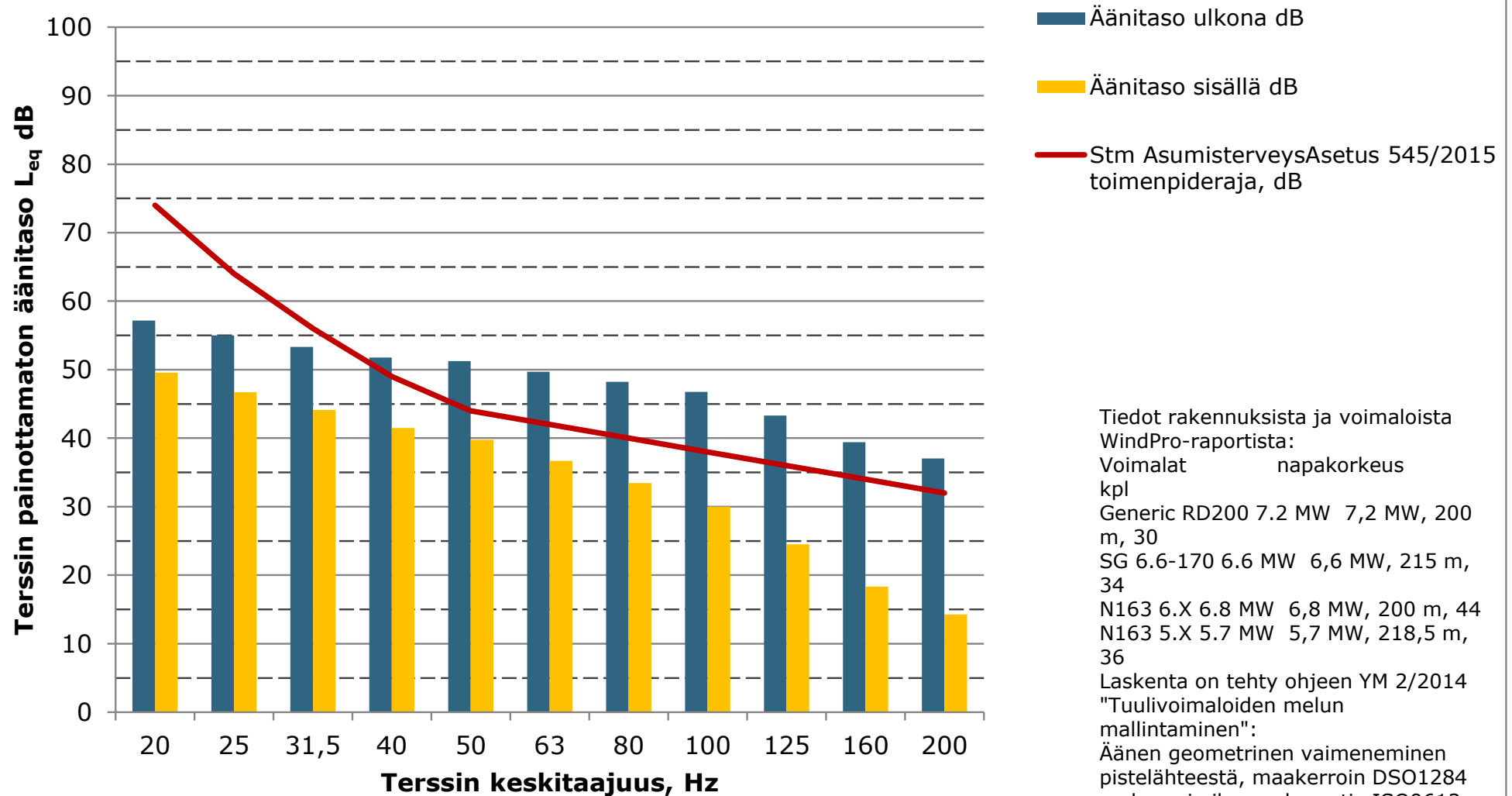


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus R
(Korpelanperä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



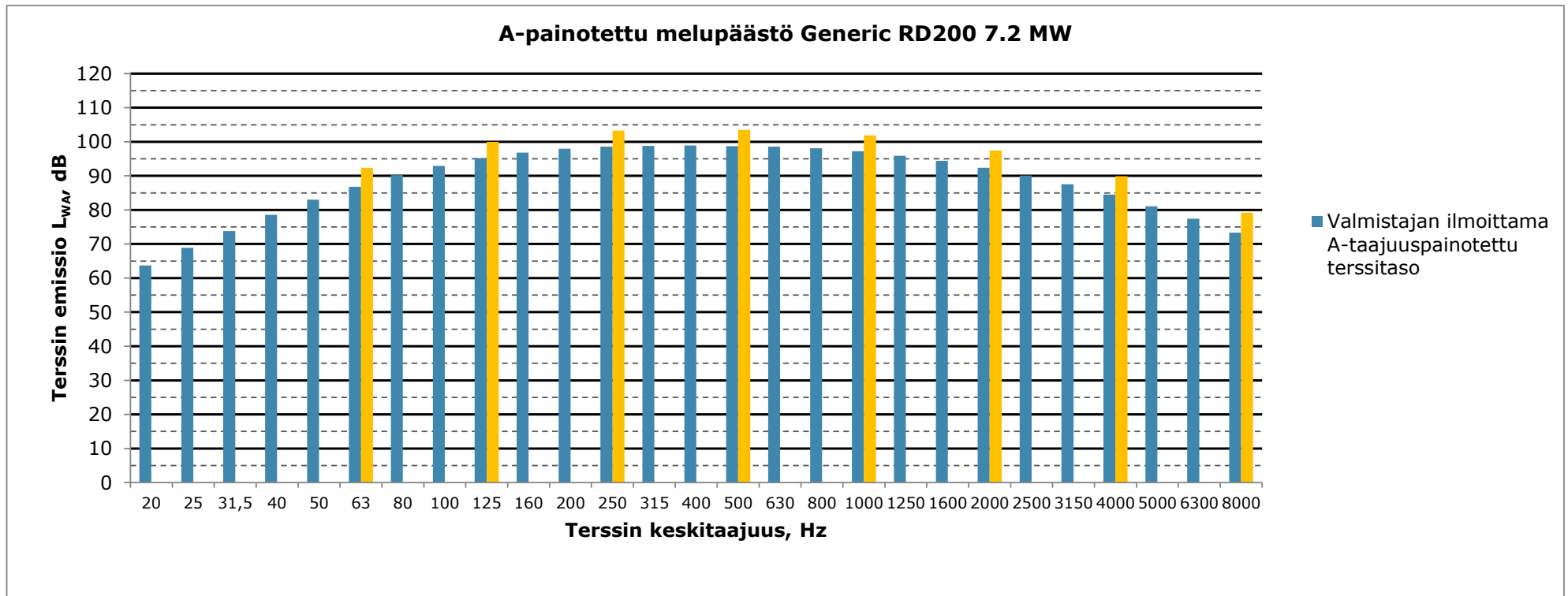


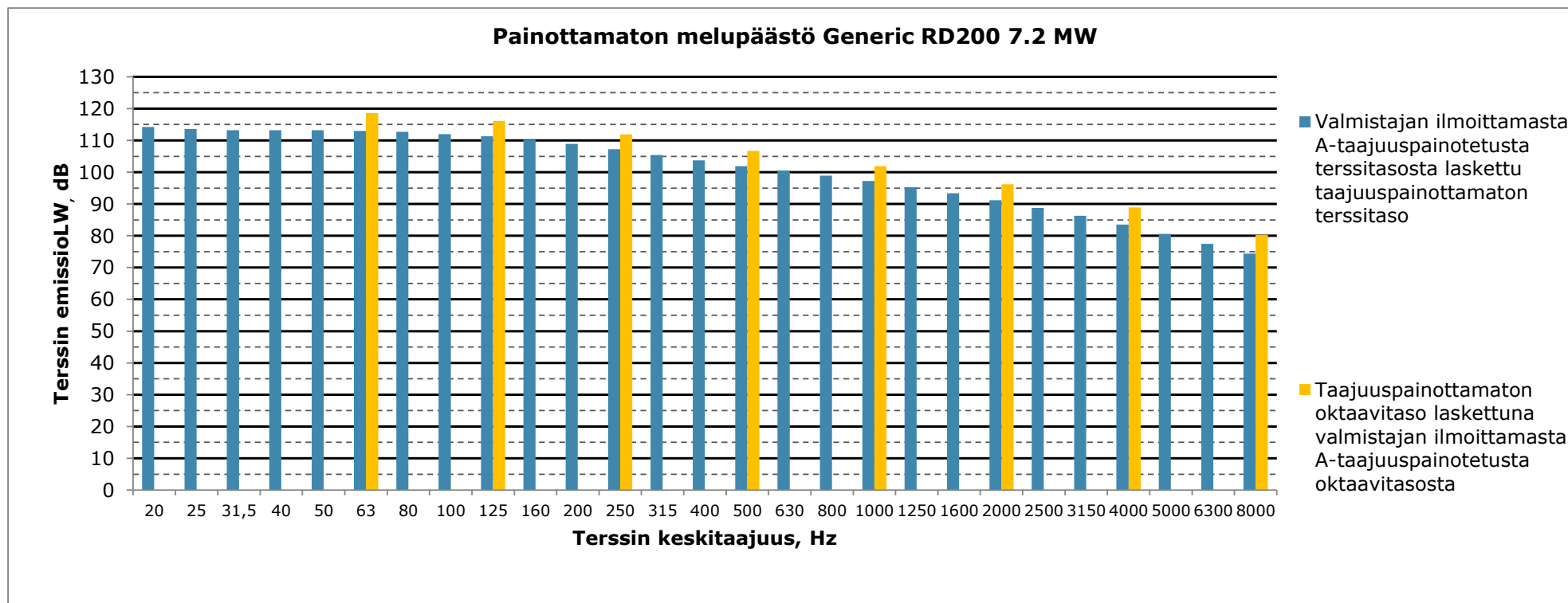
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus T
(Kärsämäenneva), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**

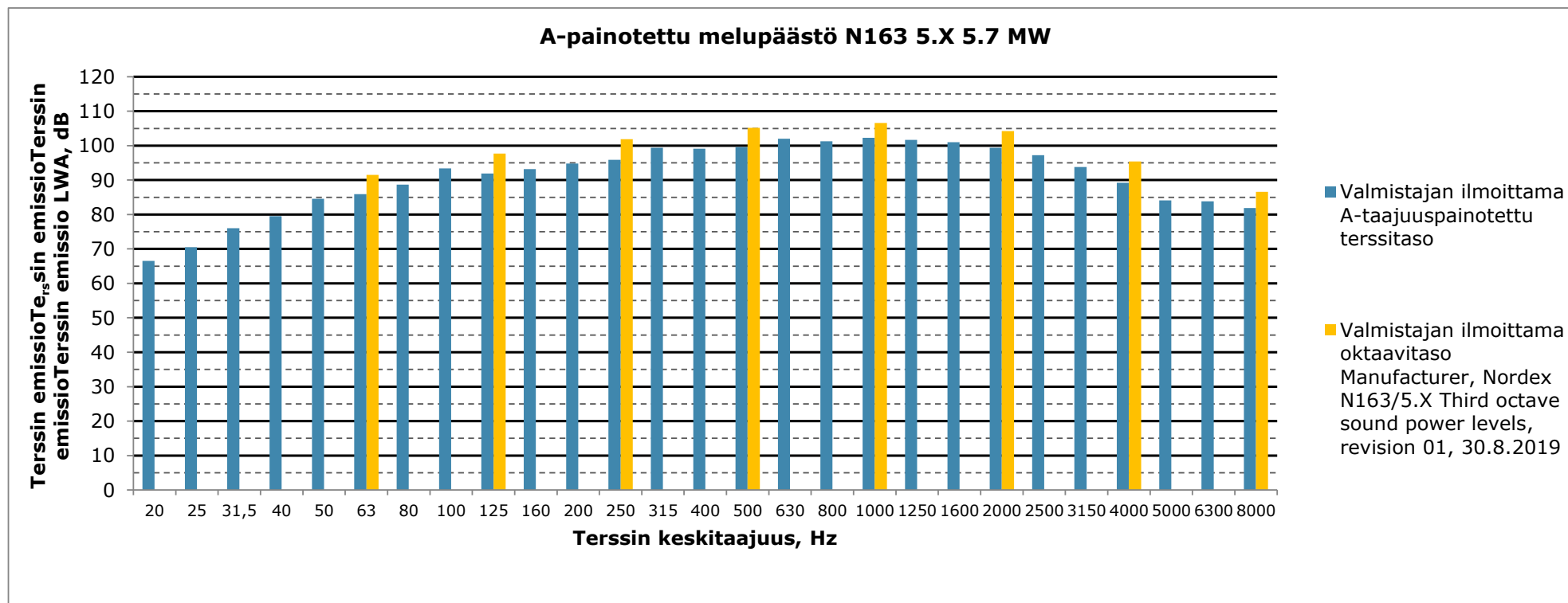


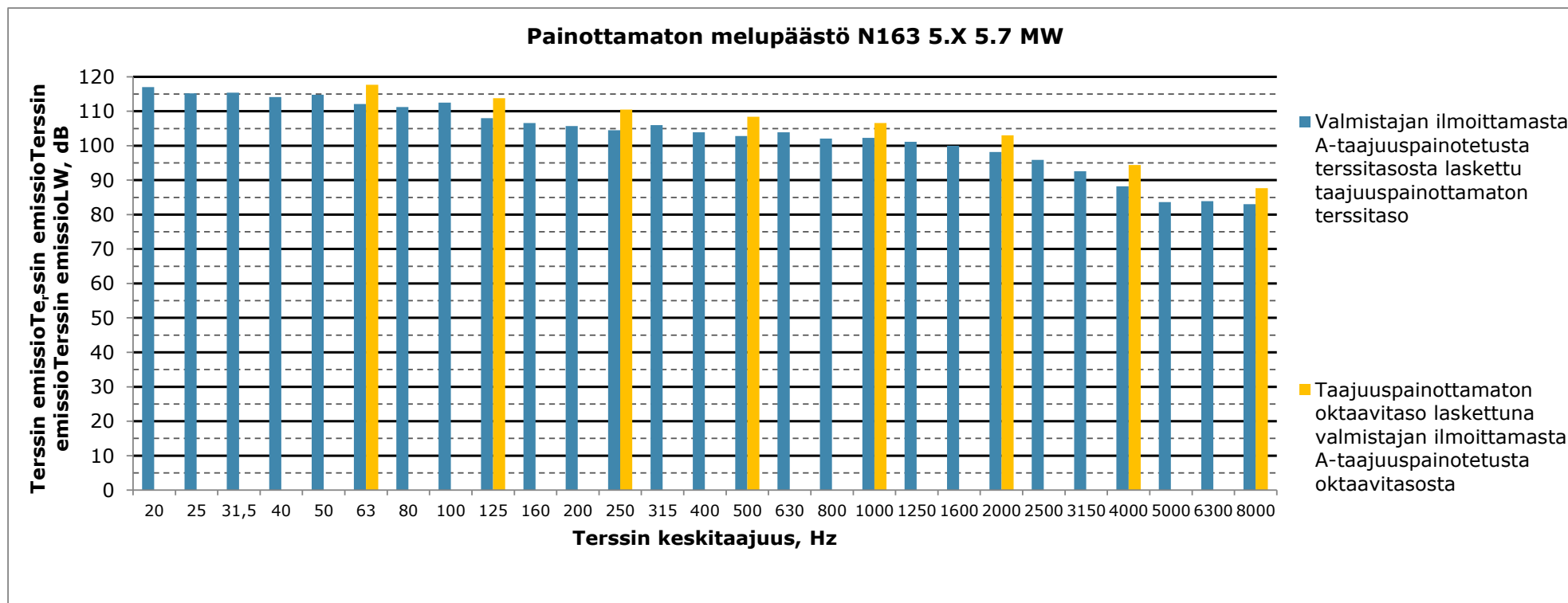
6.5.2024

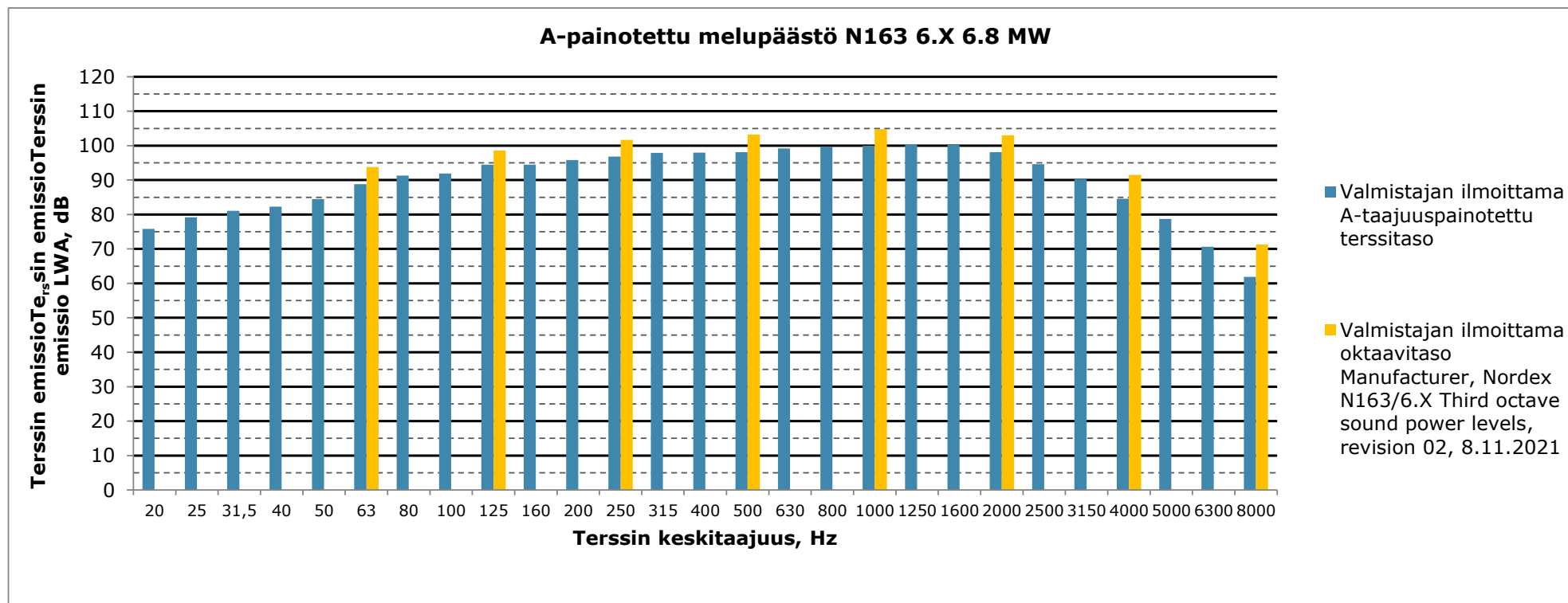
Liite 14. Matalataajuisen melun yhteisvaikutuksen rakennuskohtaiset arvot – Hankevaihtoehto 2 (VE2).

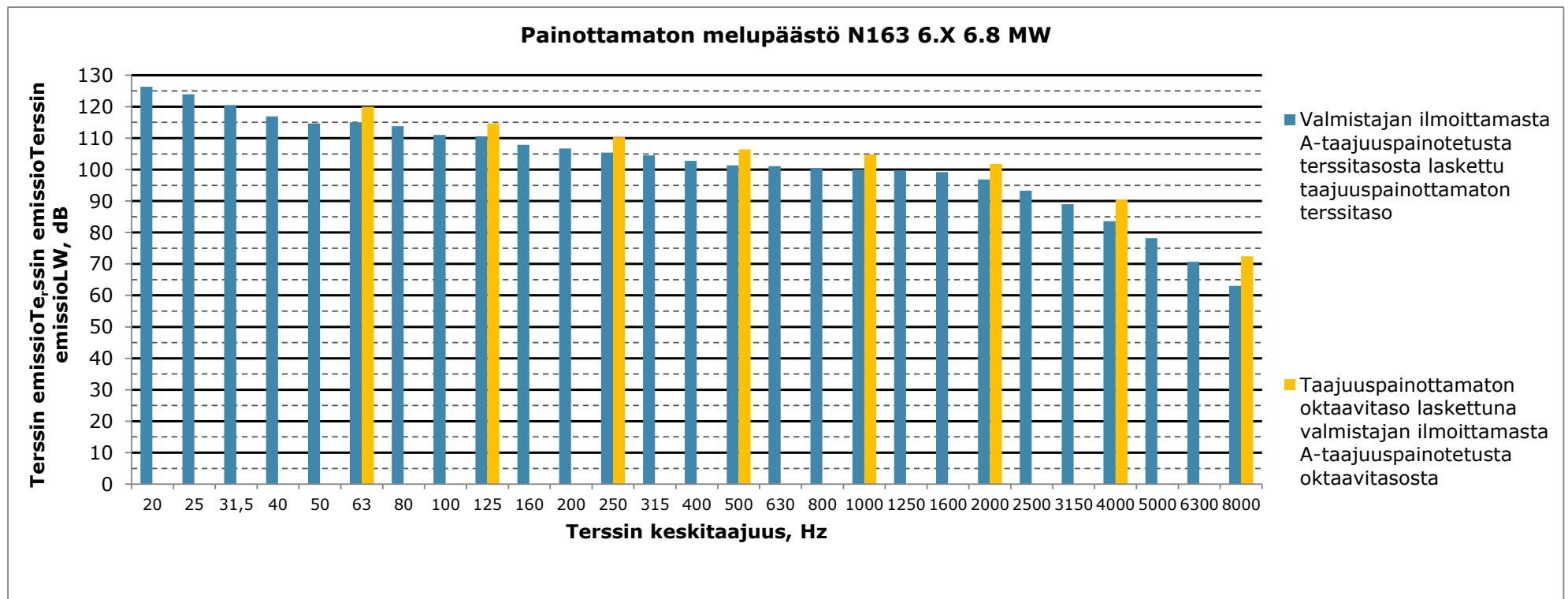


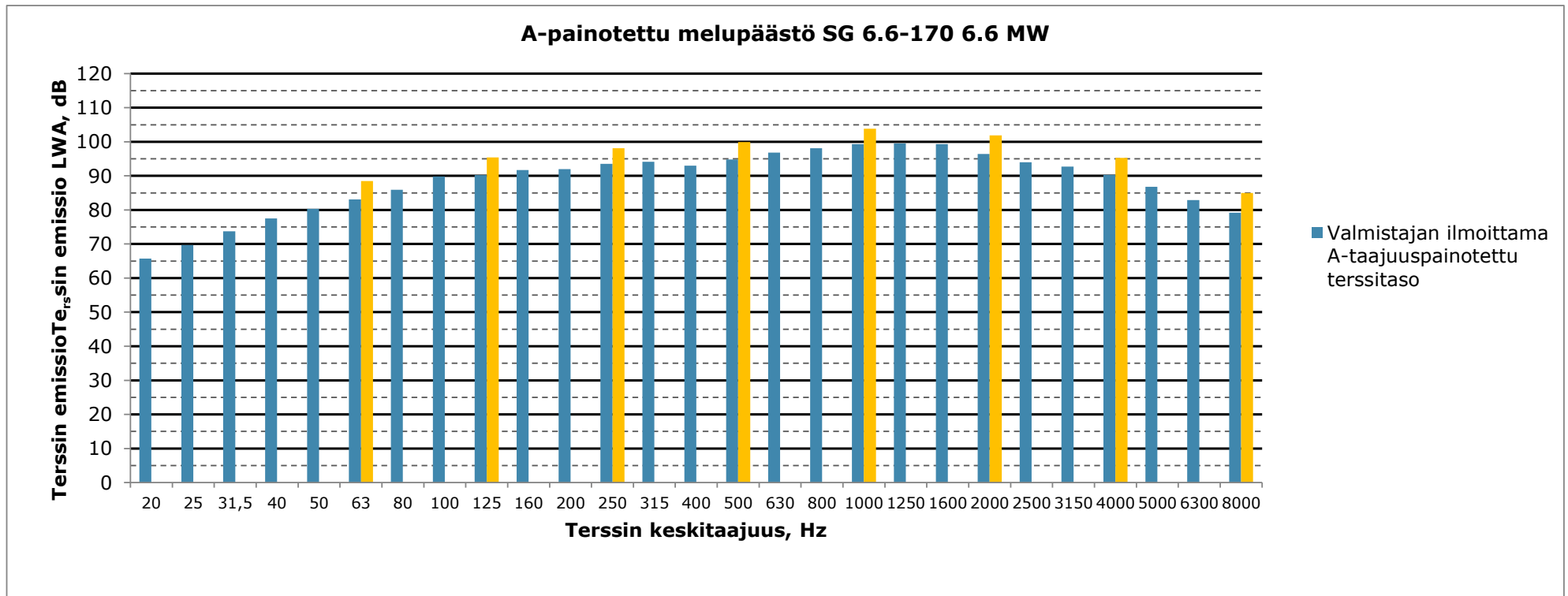


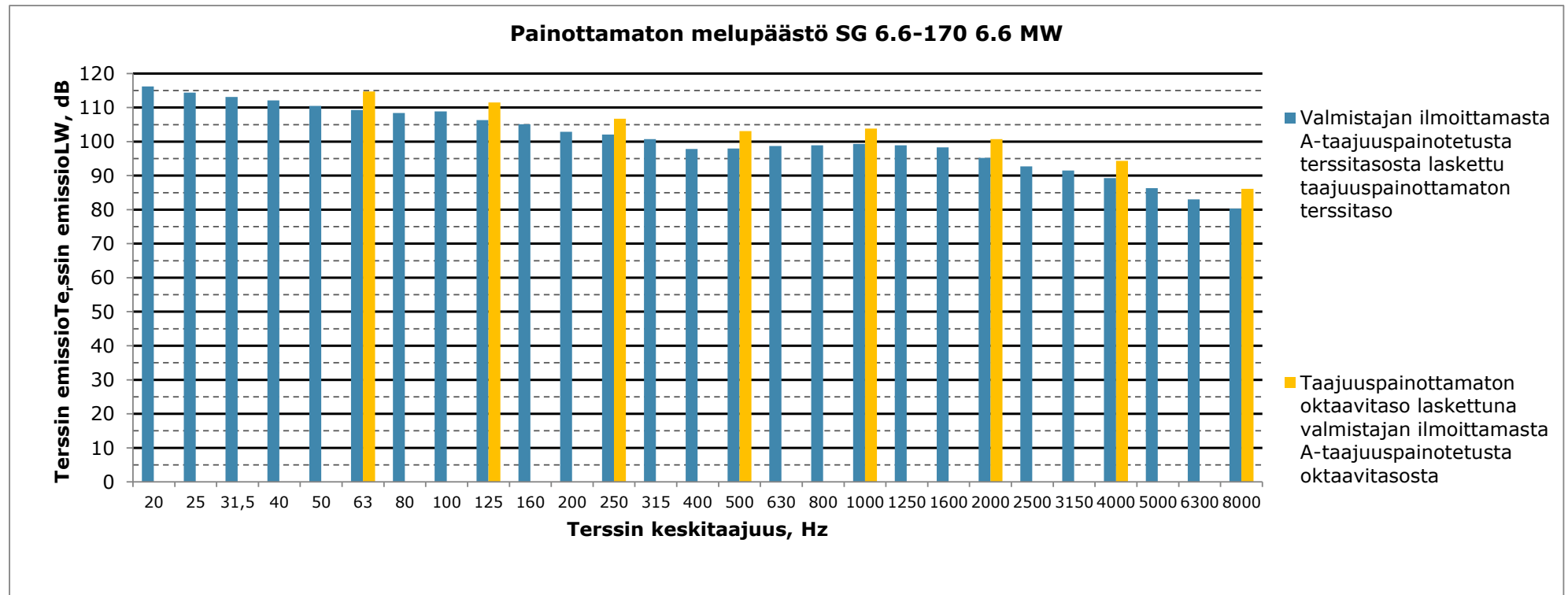


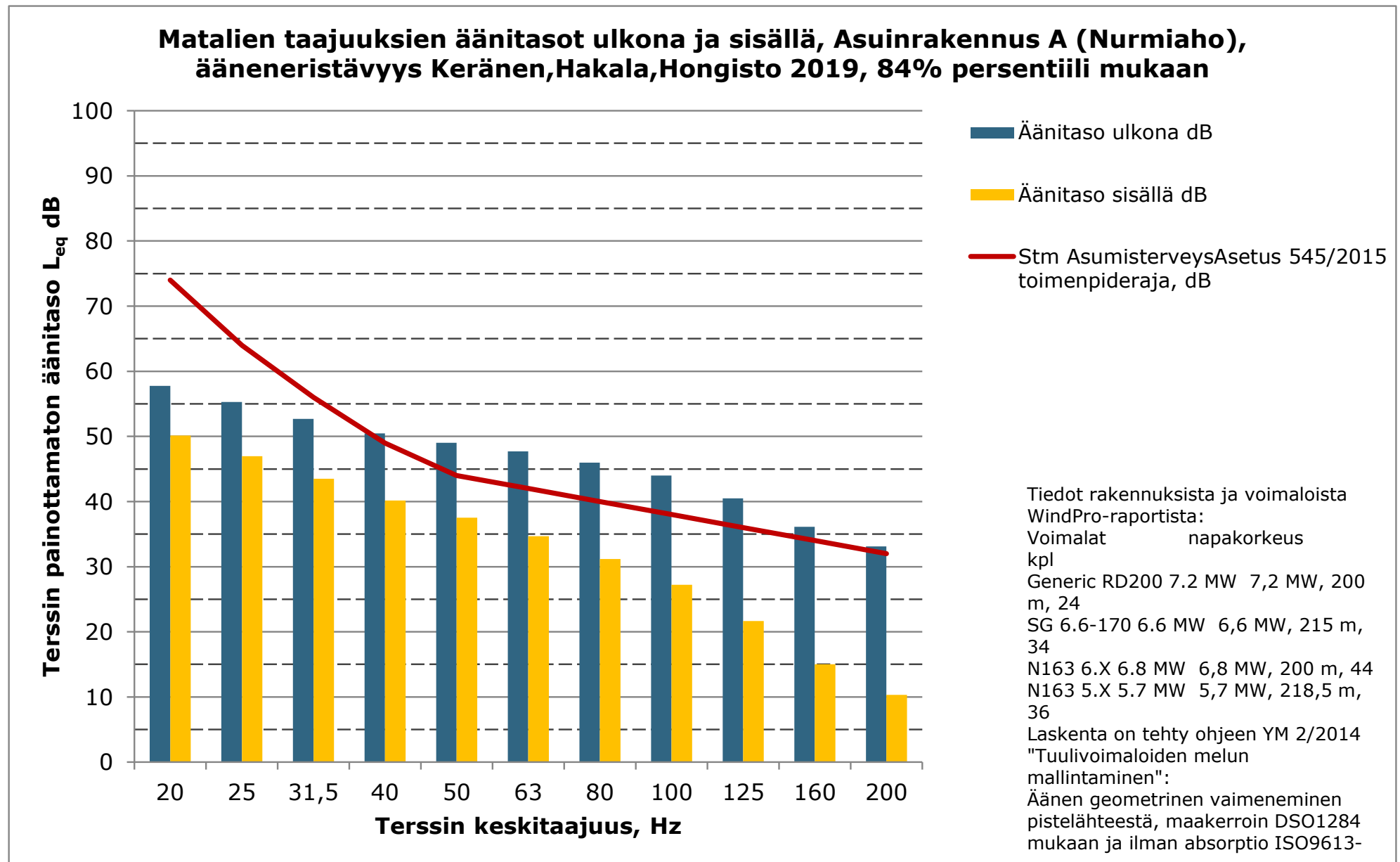




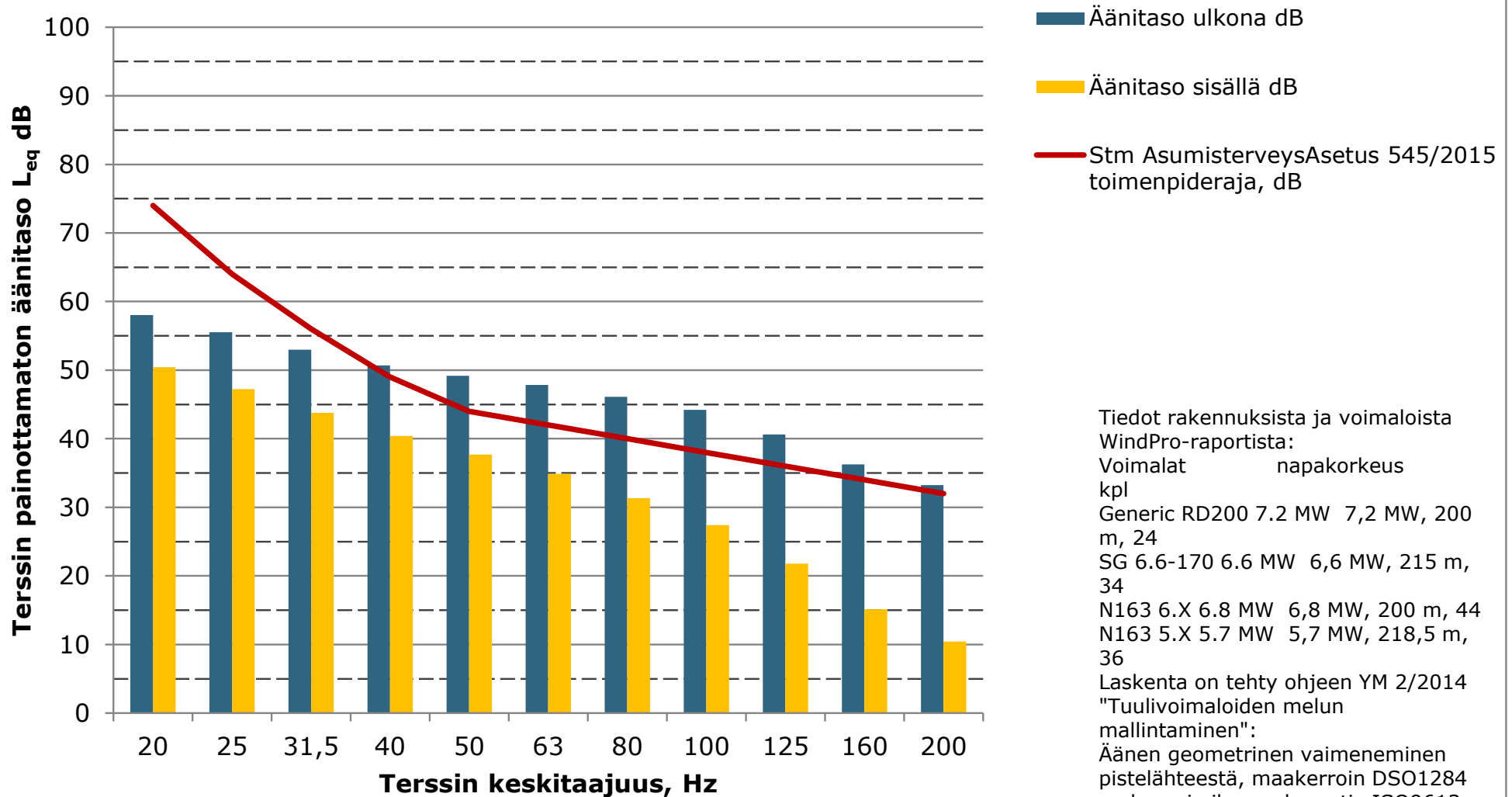




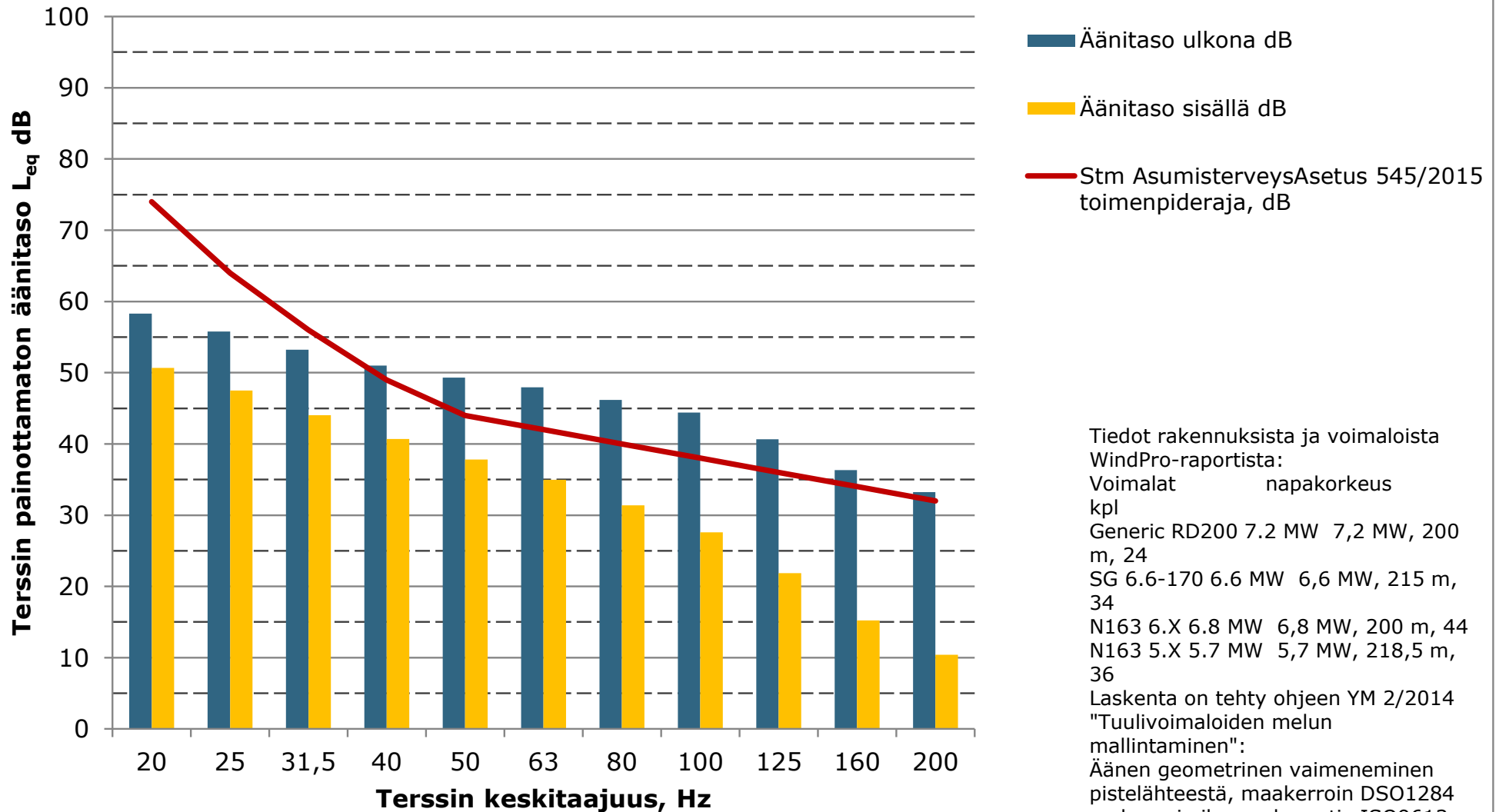




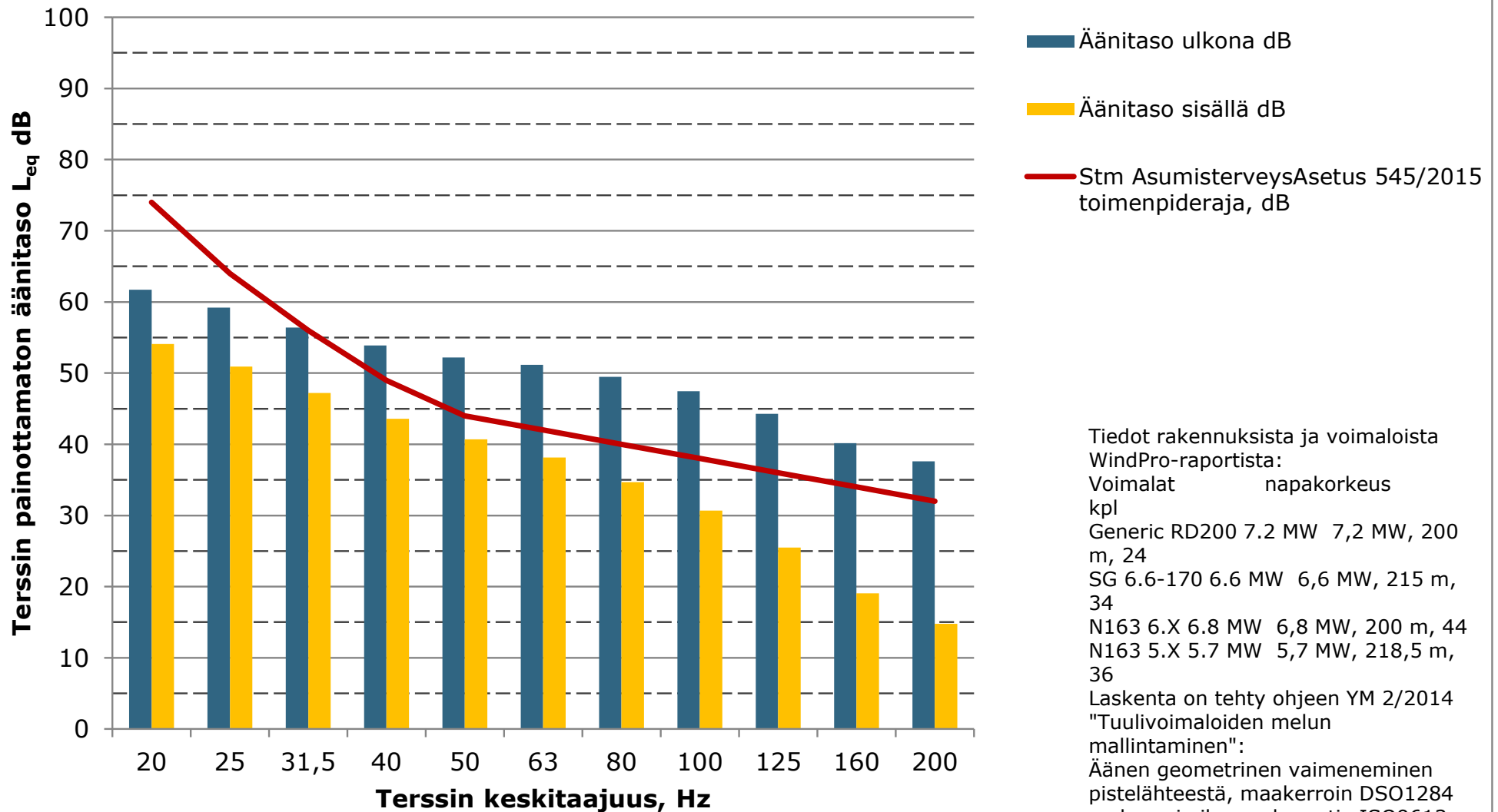
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus B
(Kivikangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**



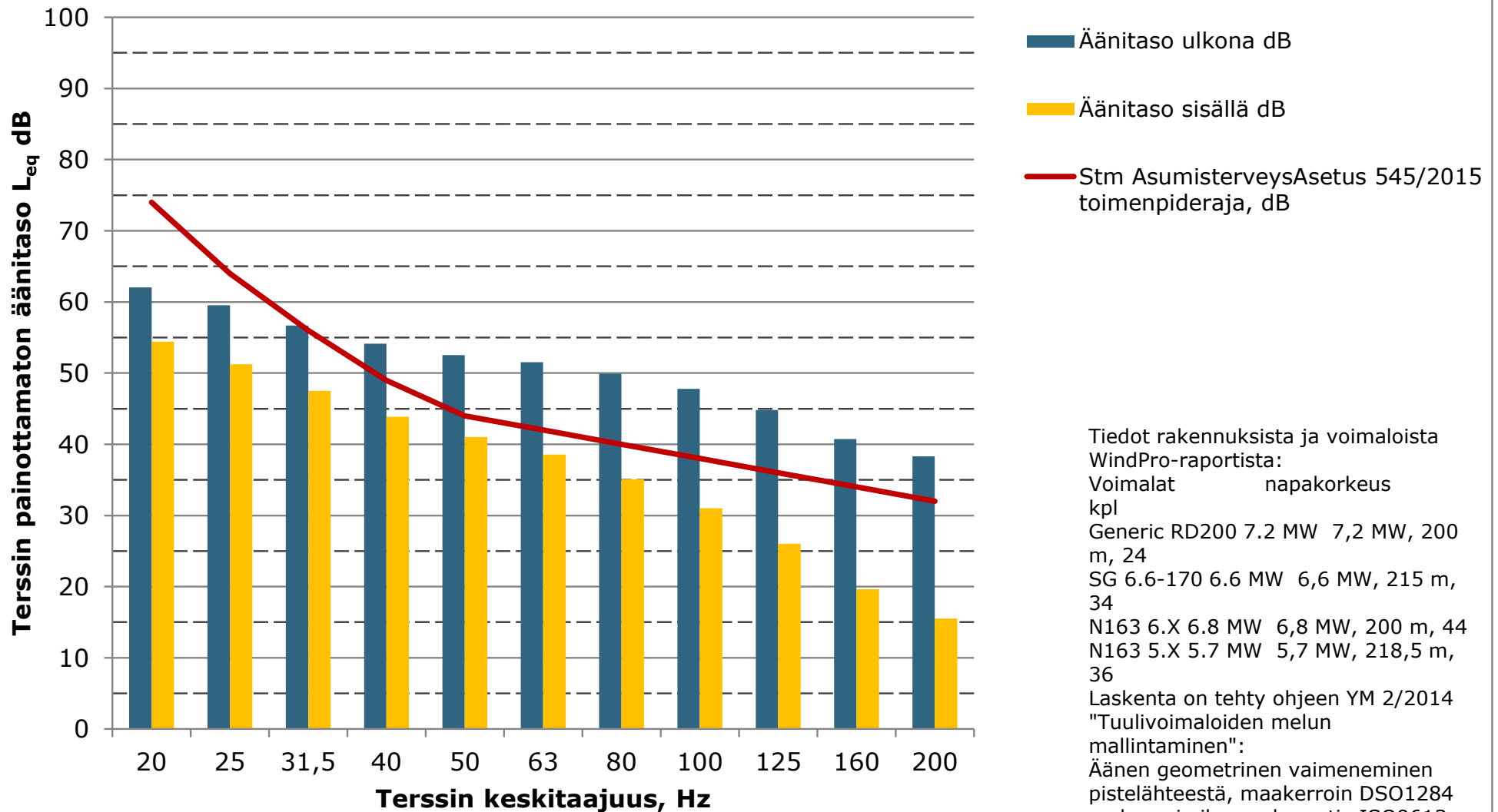
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus C (Koukkula), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



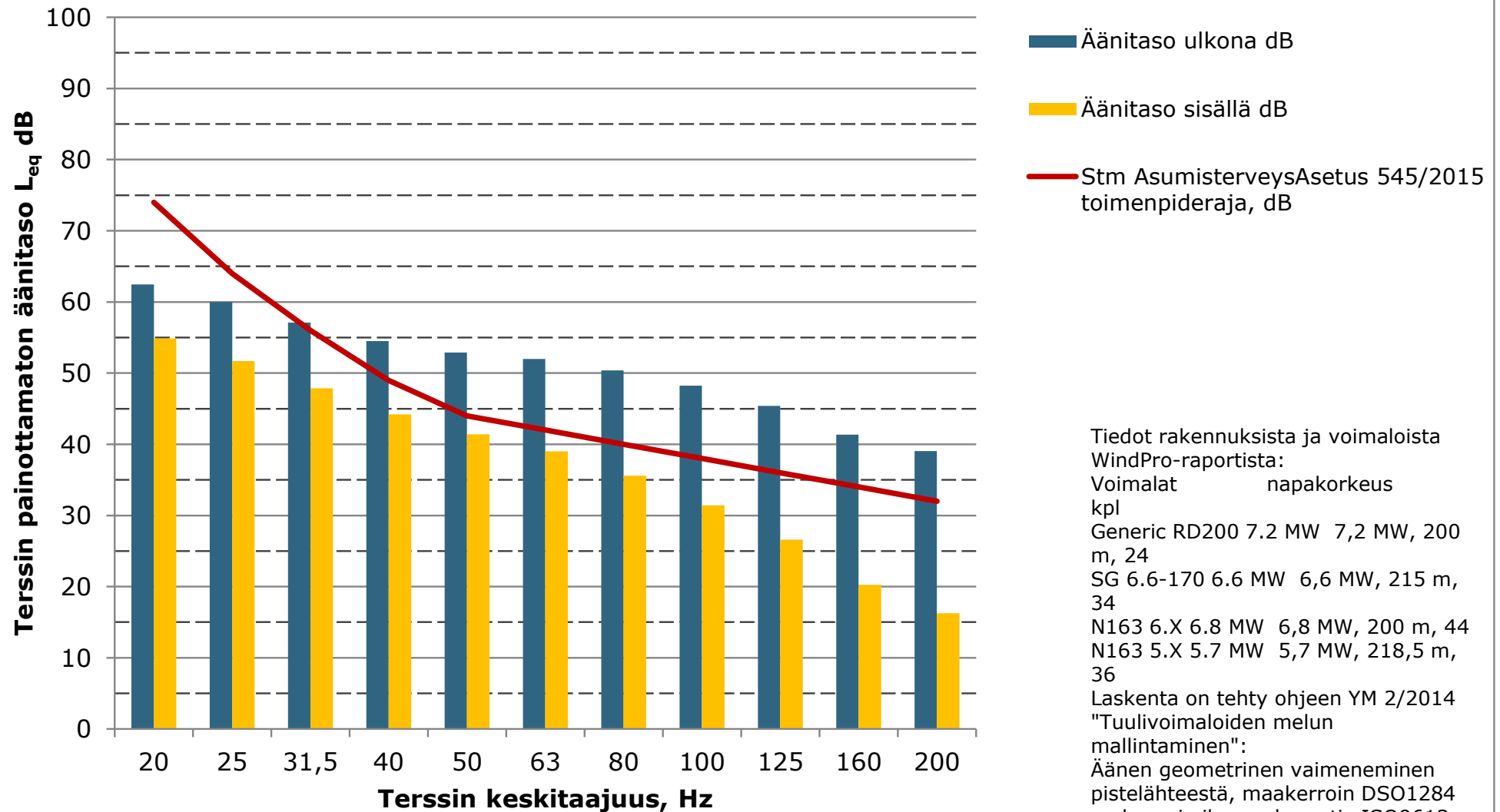
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus D (Konola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



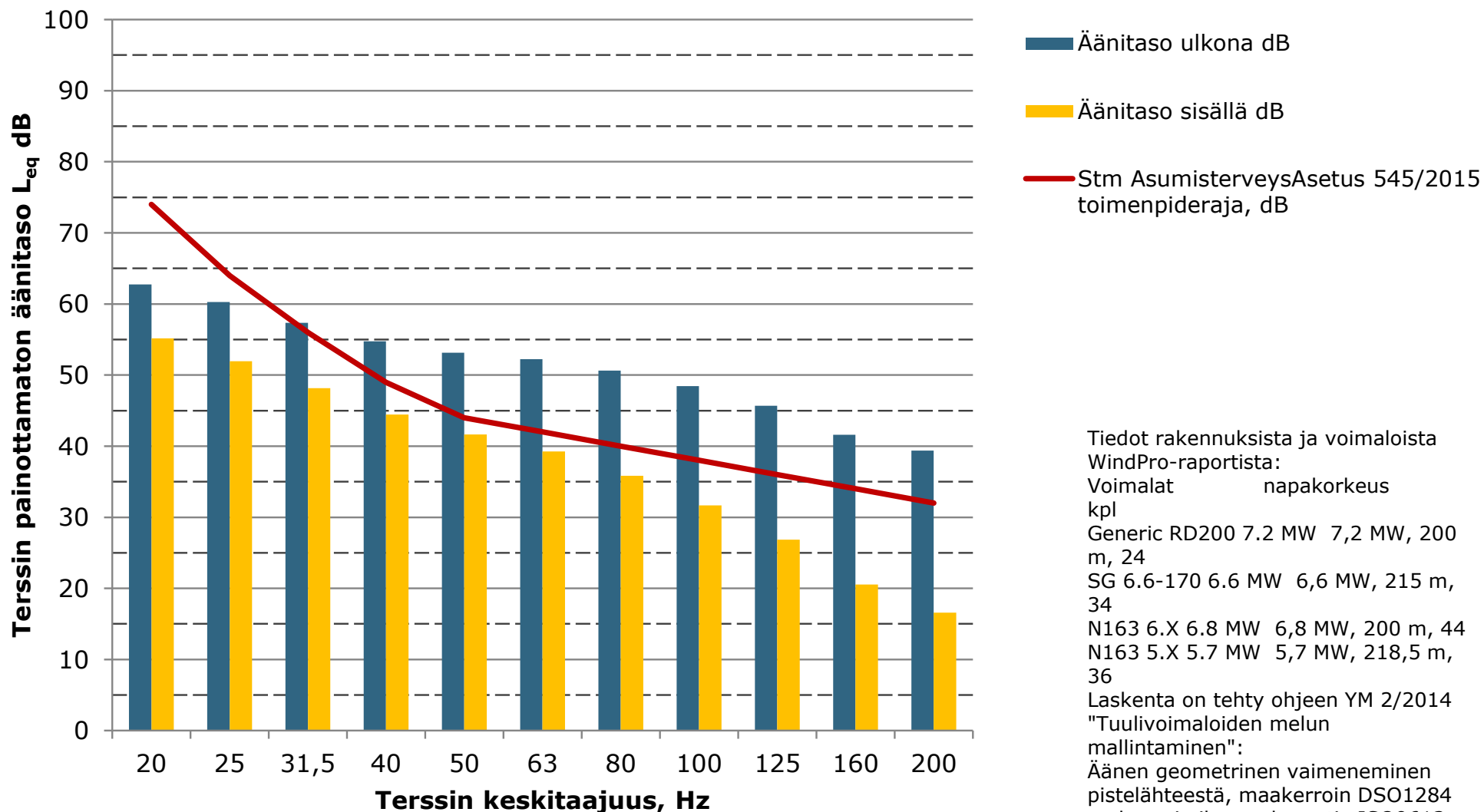
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus E (Piippo), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



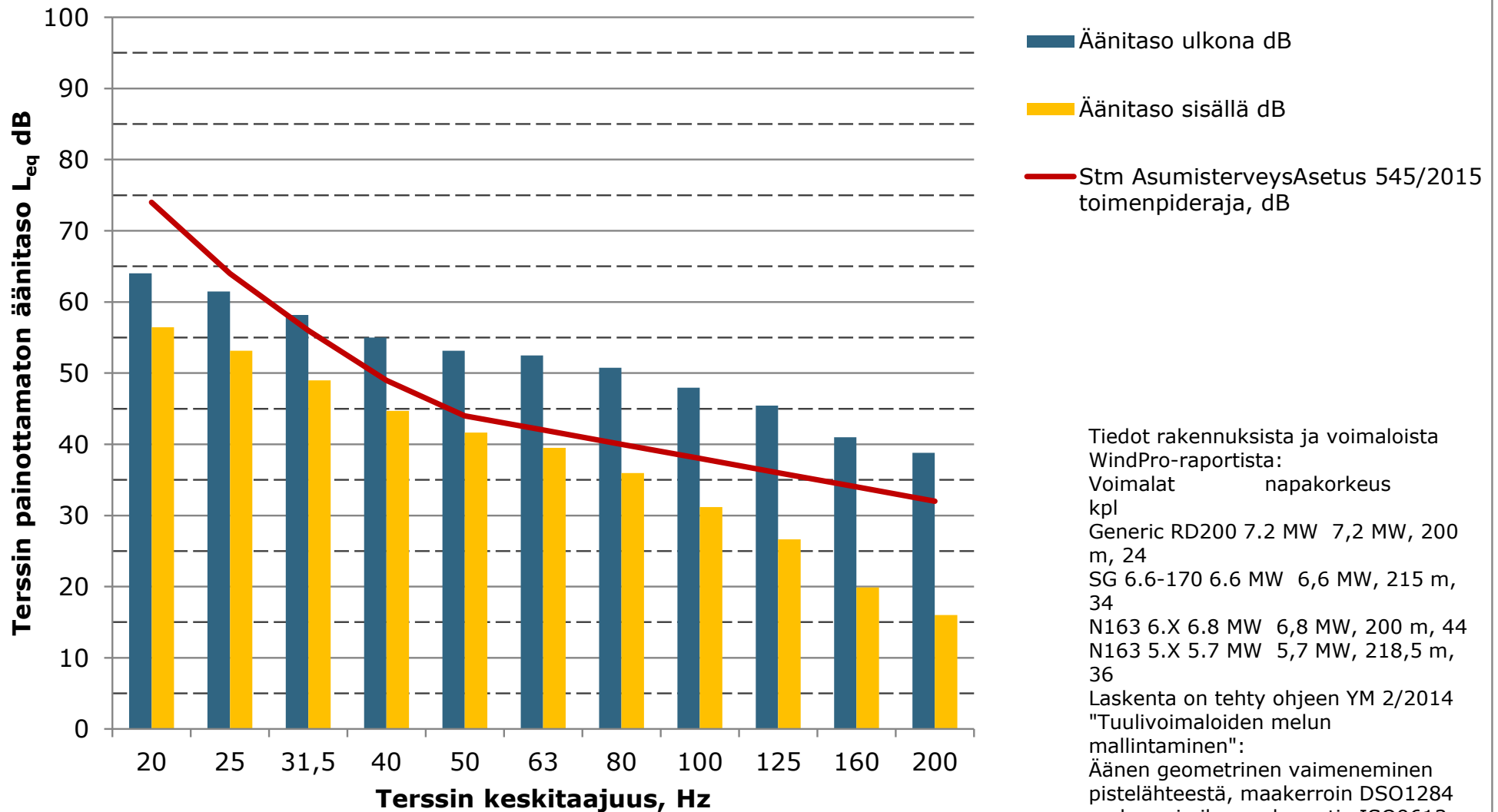
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Pääkkö), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



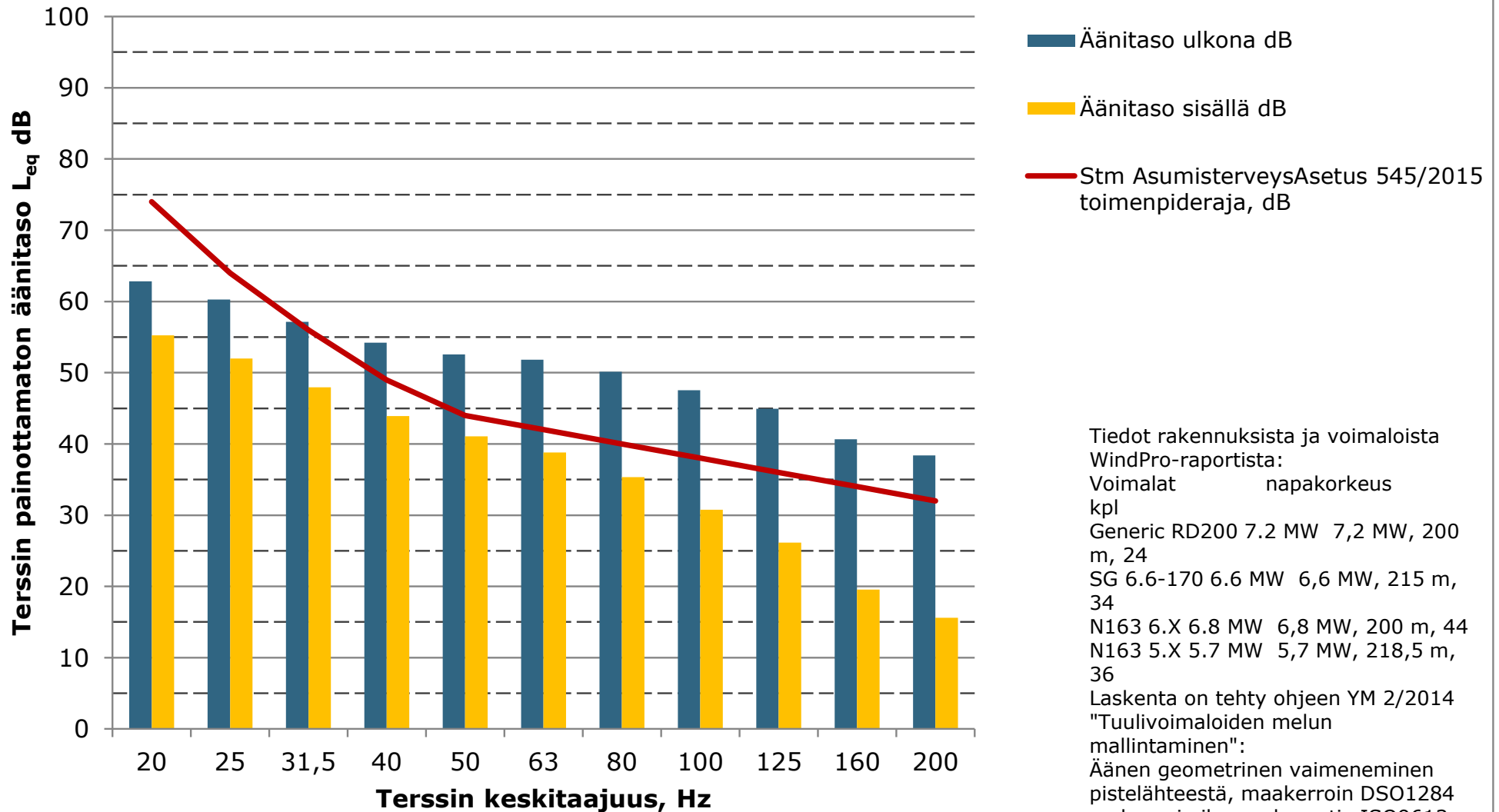
Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus G (Pääkkölä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



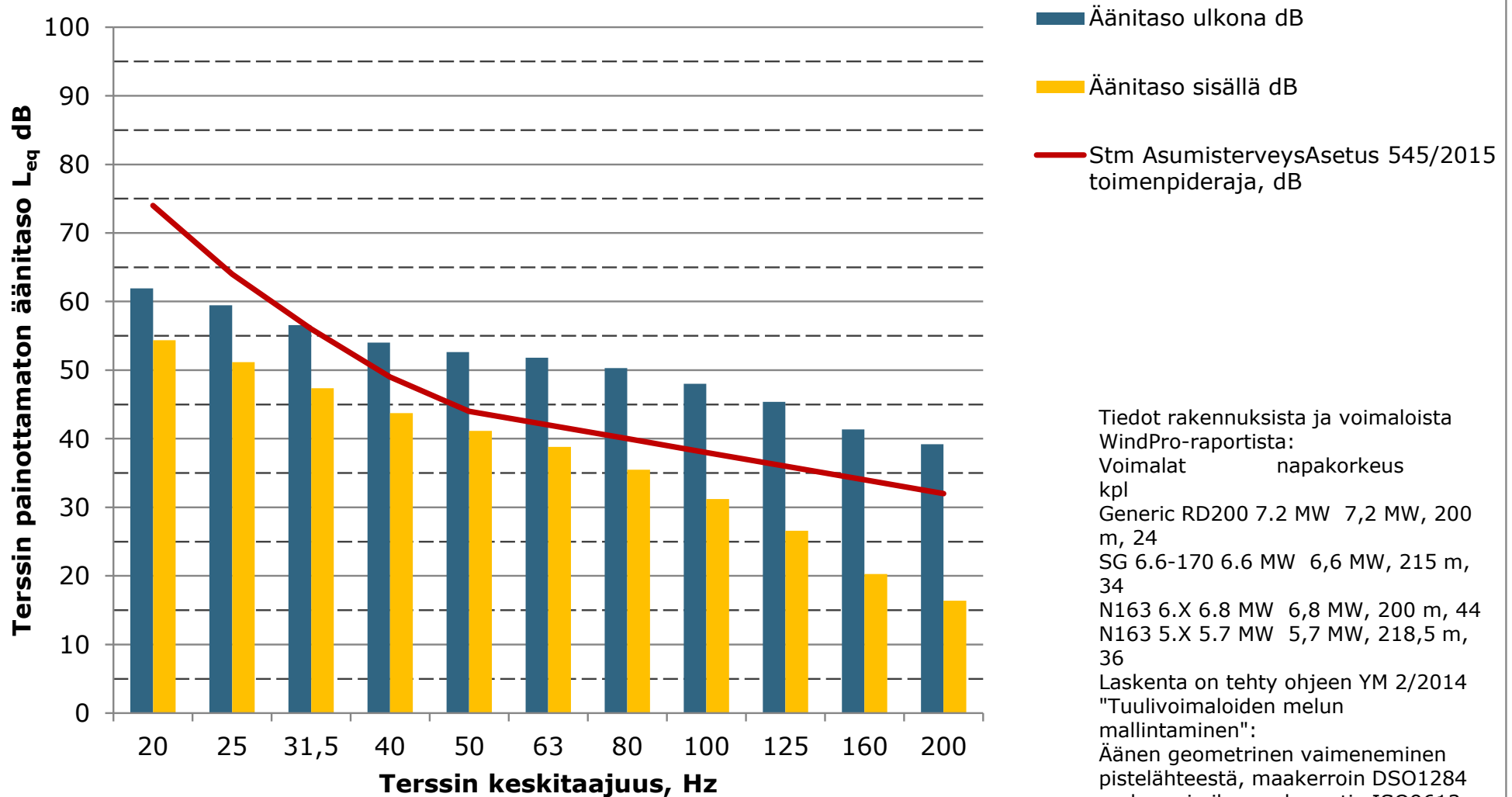
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Peltola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



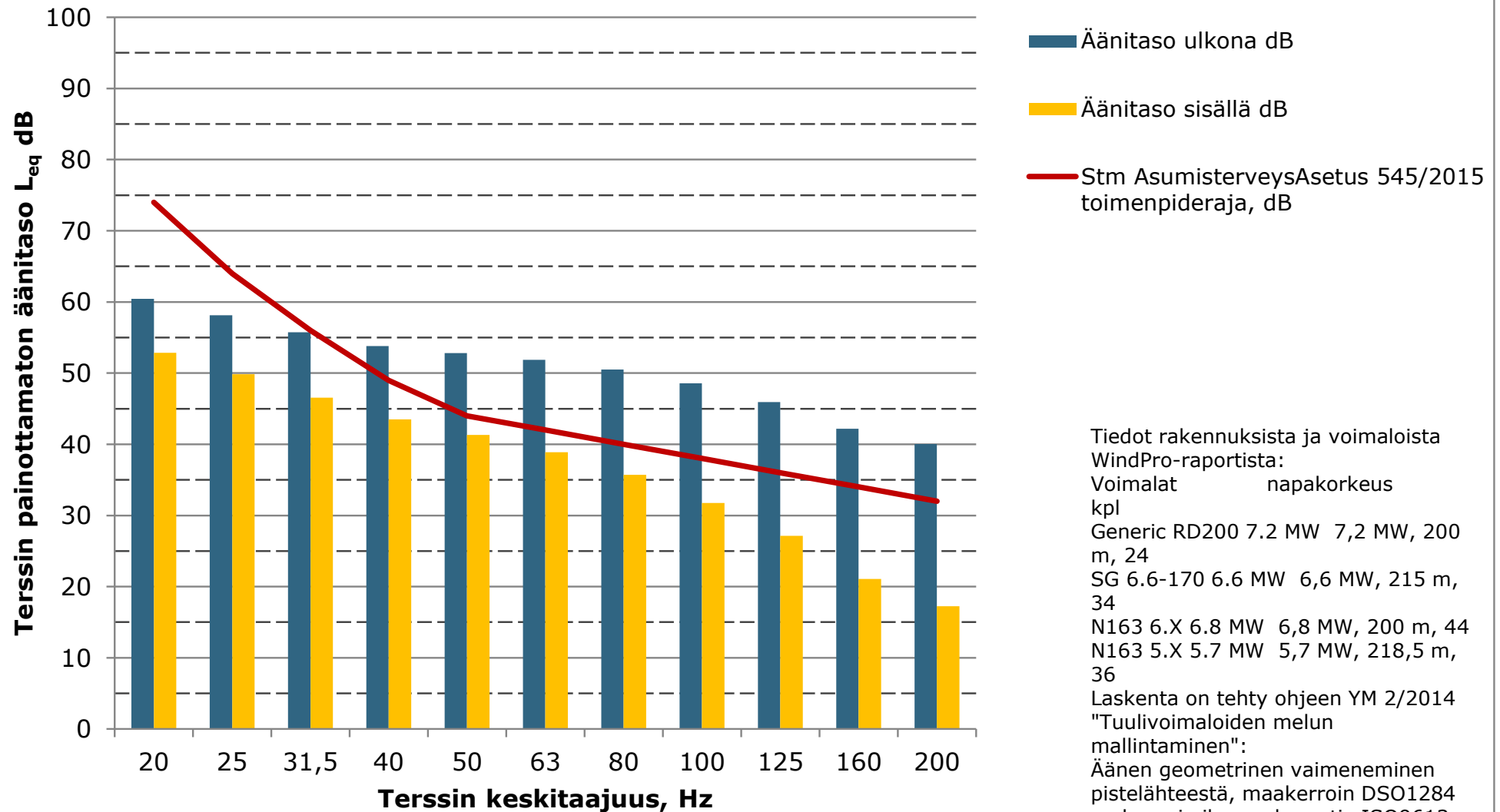
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus I (Nuuttila), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

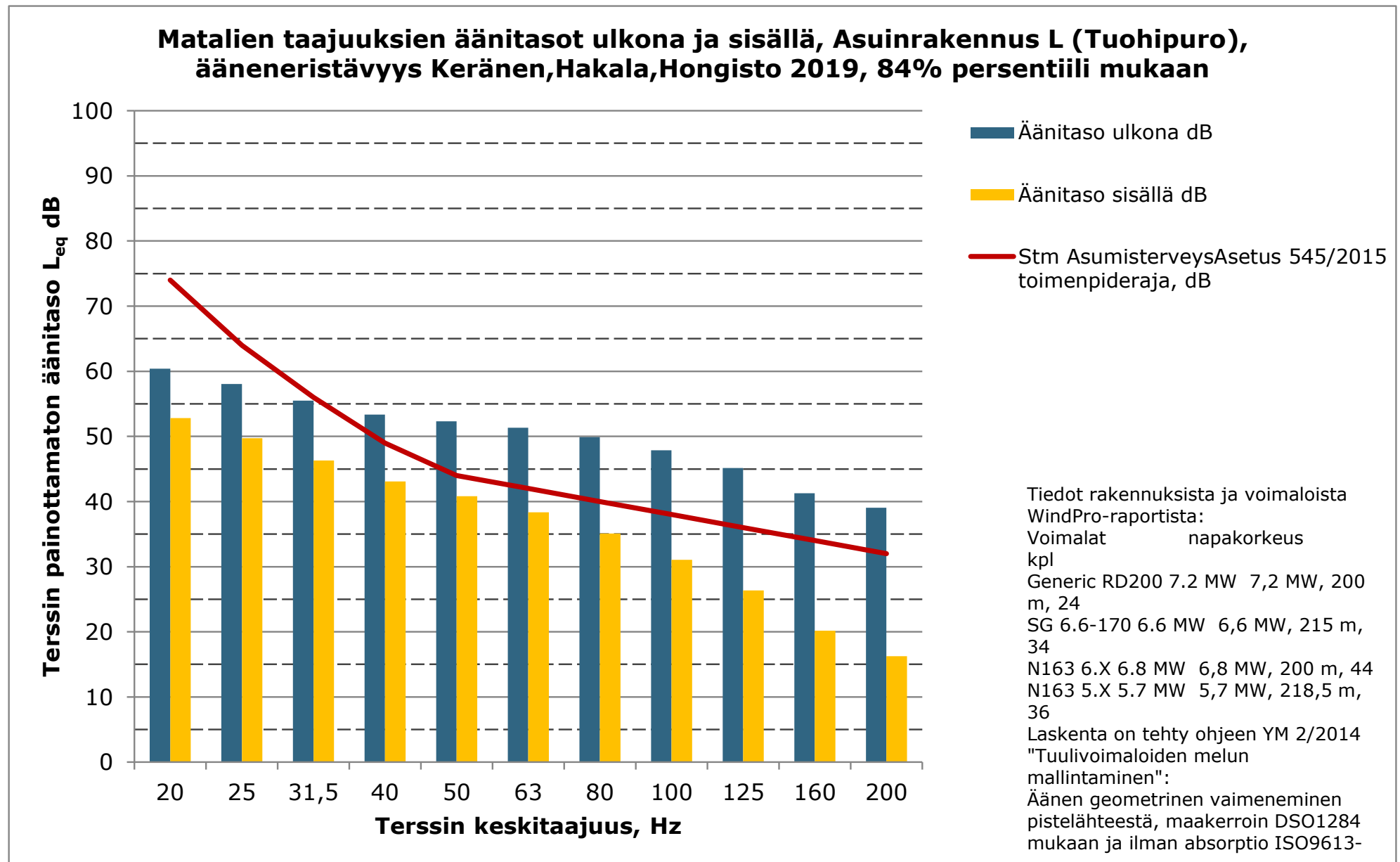


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus J
(Ahmokangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**

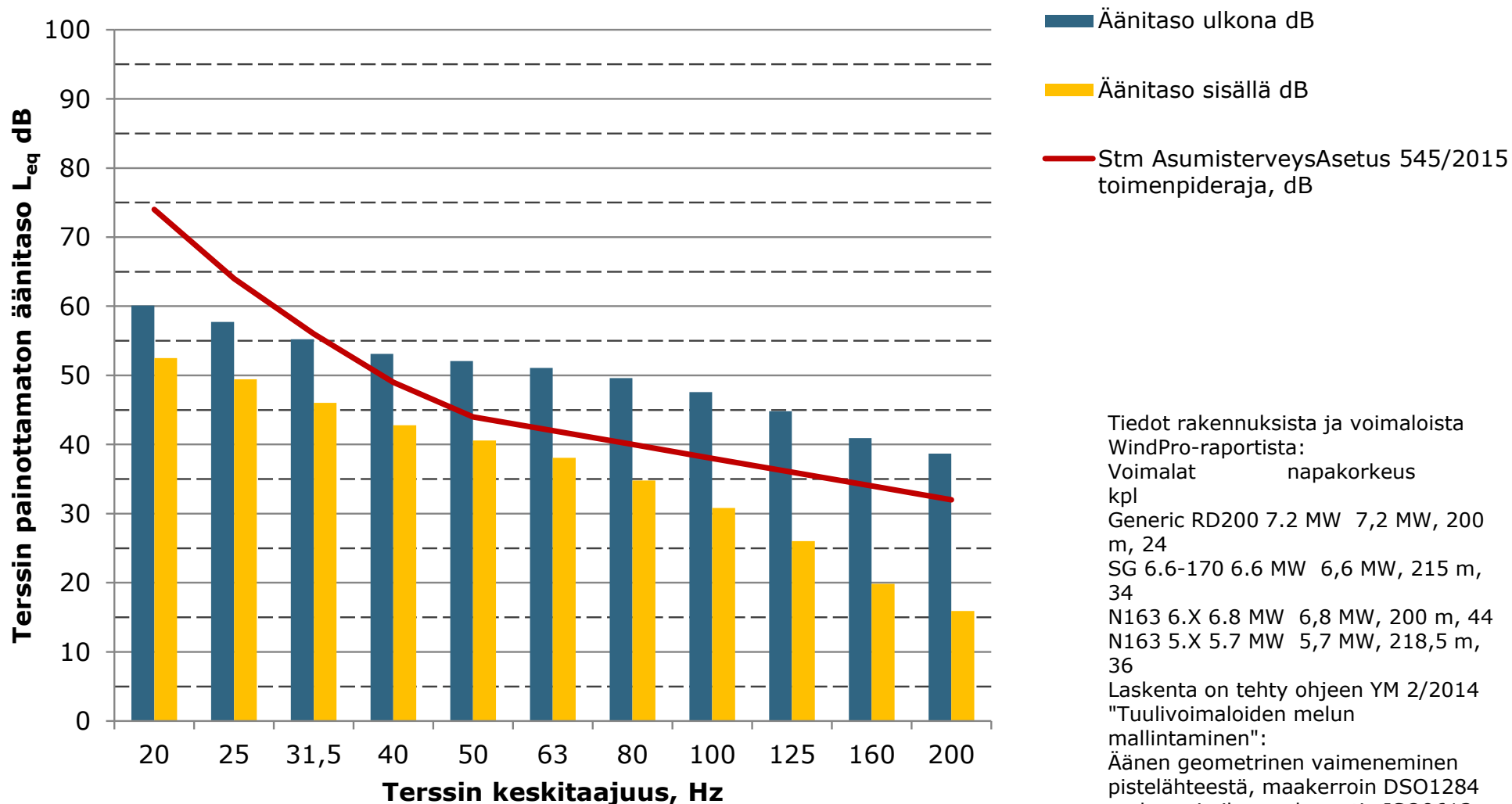


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Ketola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

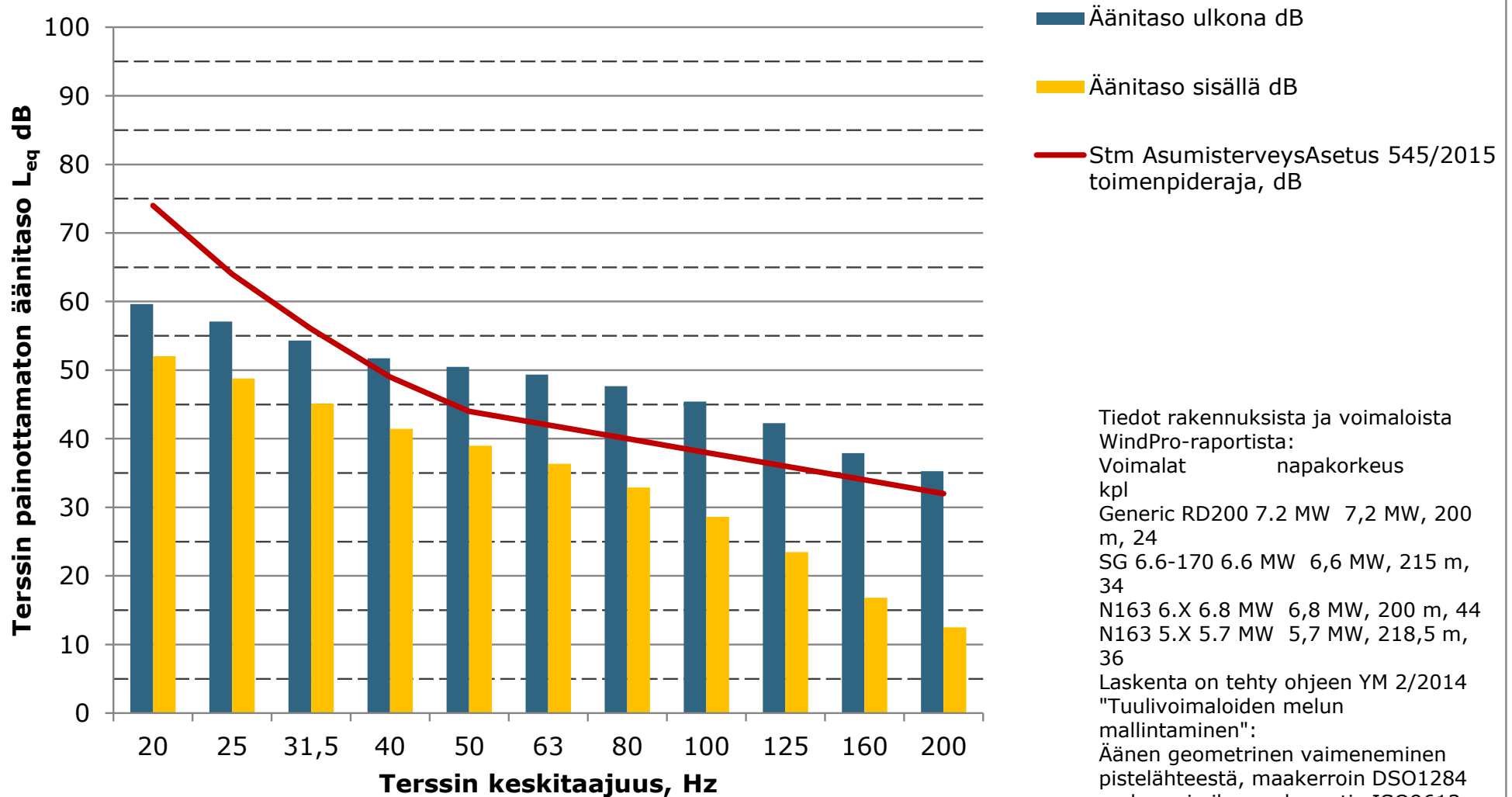




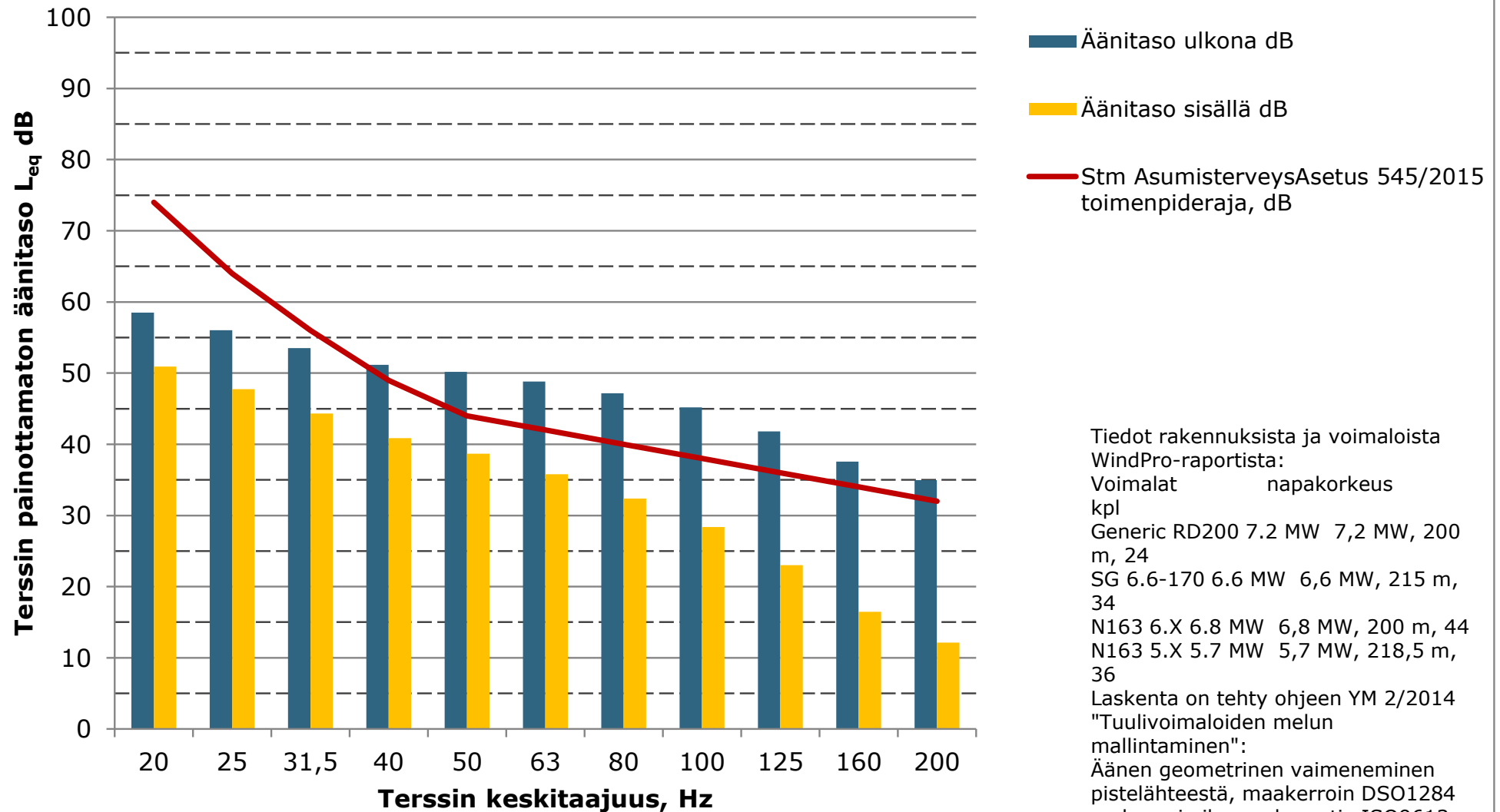
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus M
(Pilpanperä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**



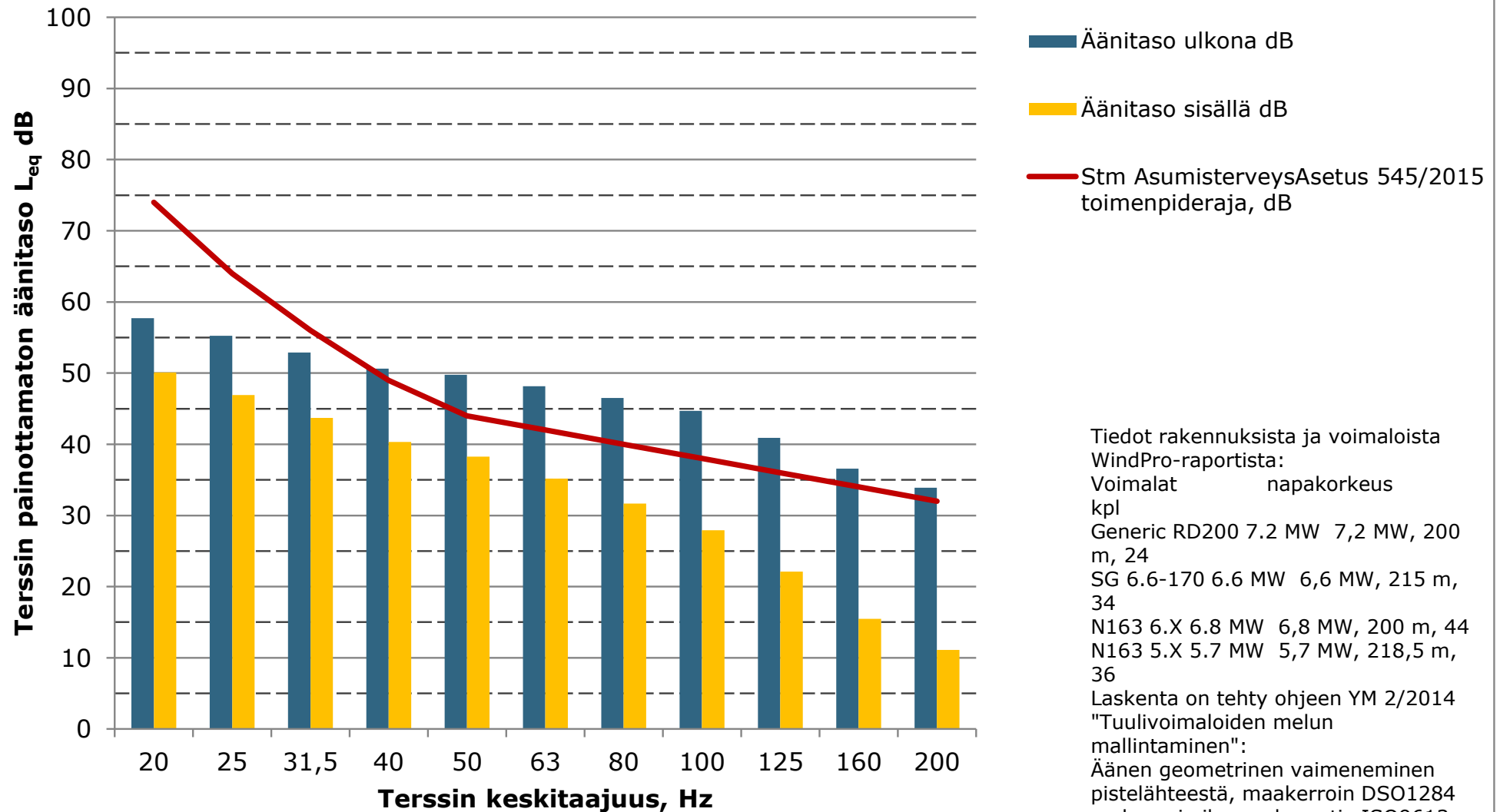
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus N
(Hanhikaarto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



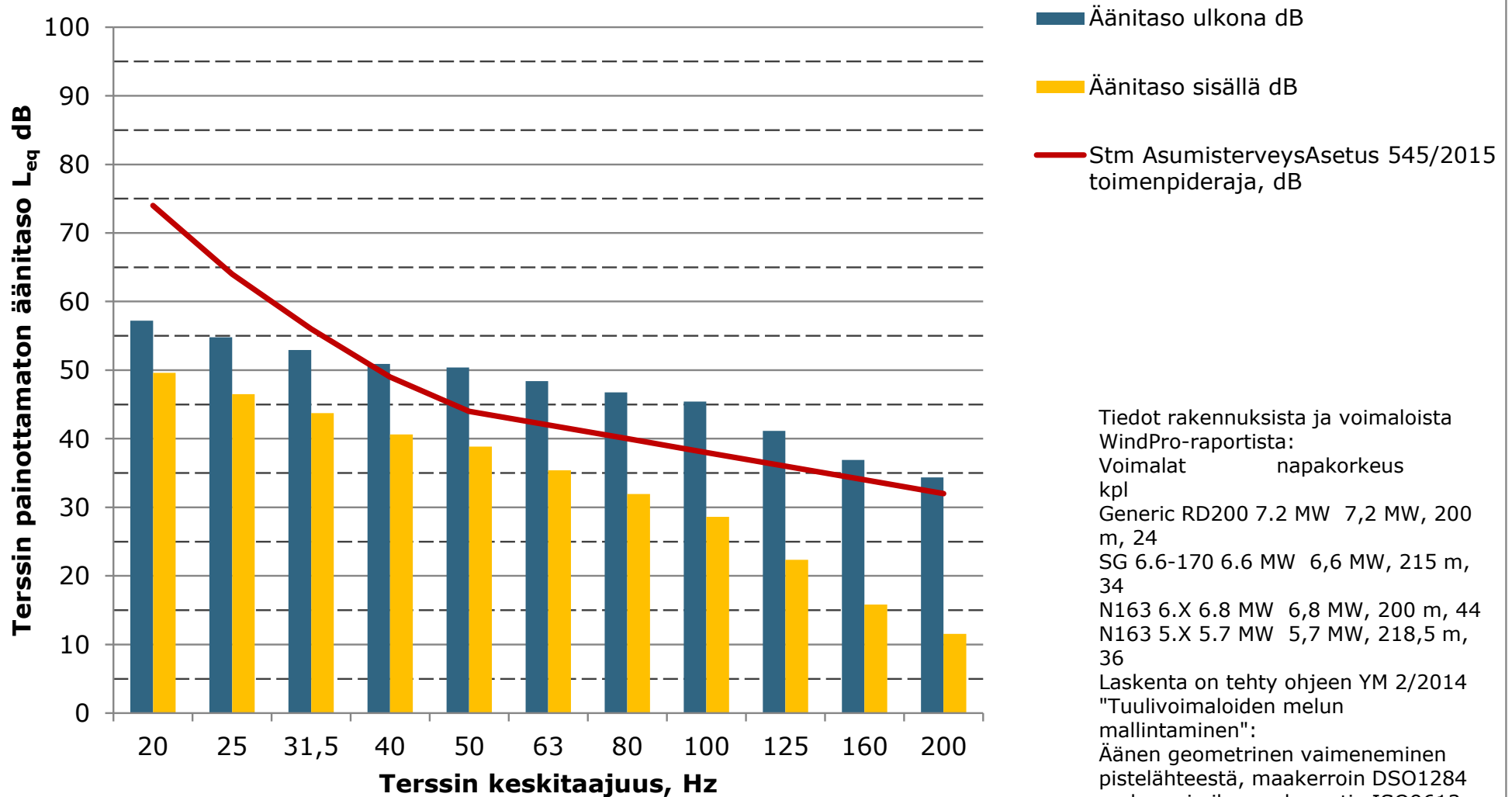
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus O (Ketola),
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



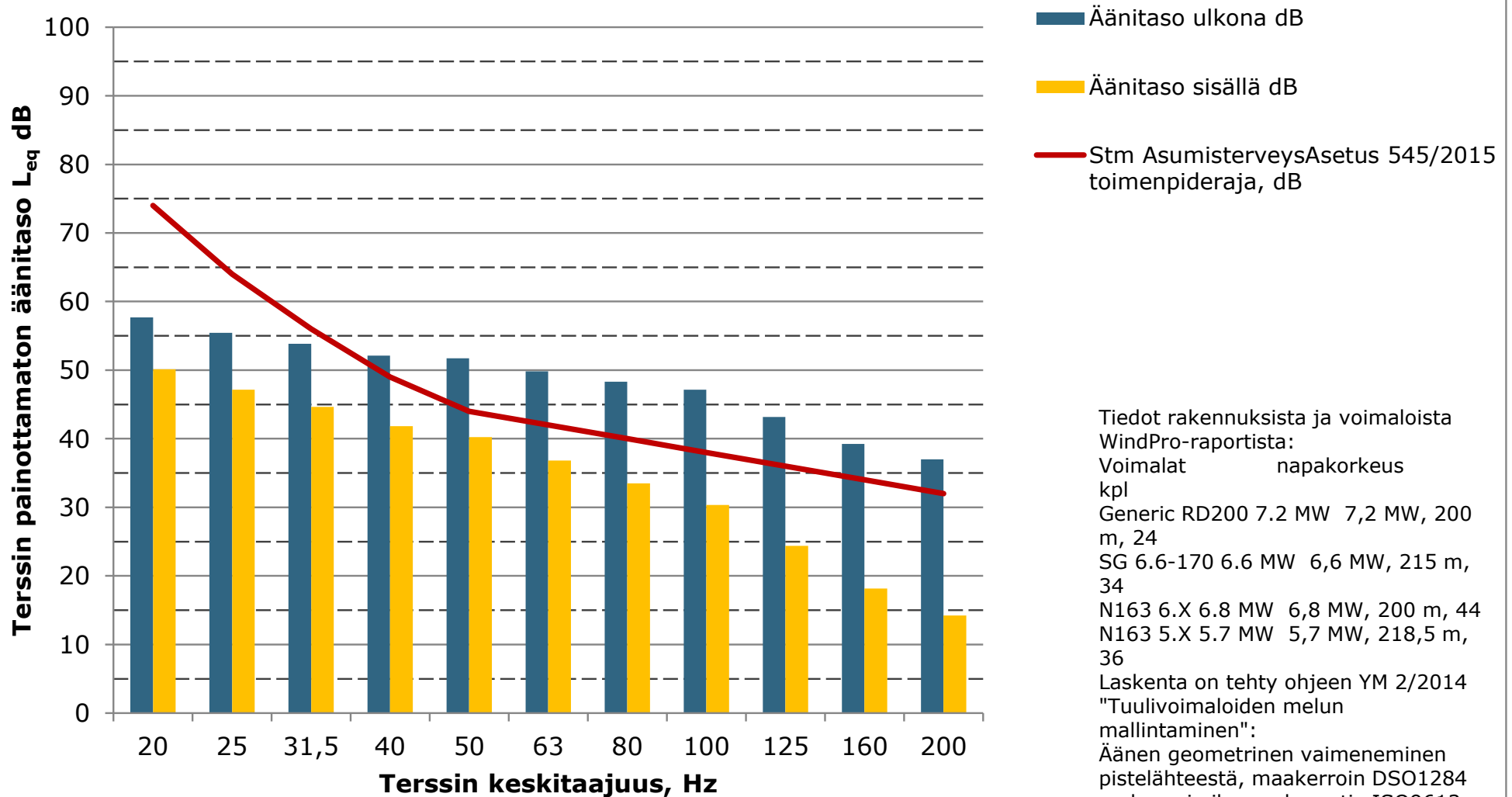
Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakenus P (Kuistila), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



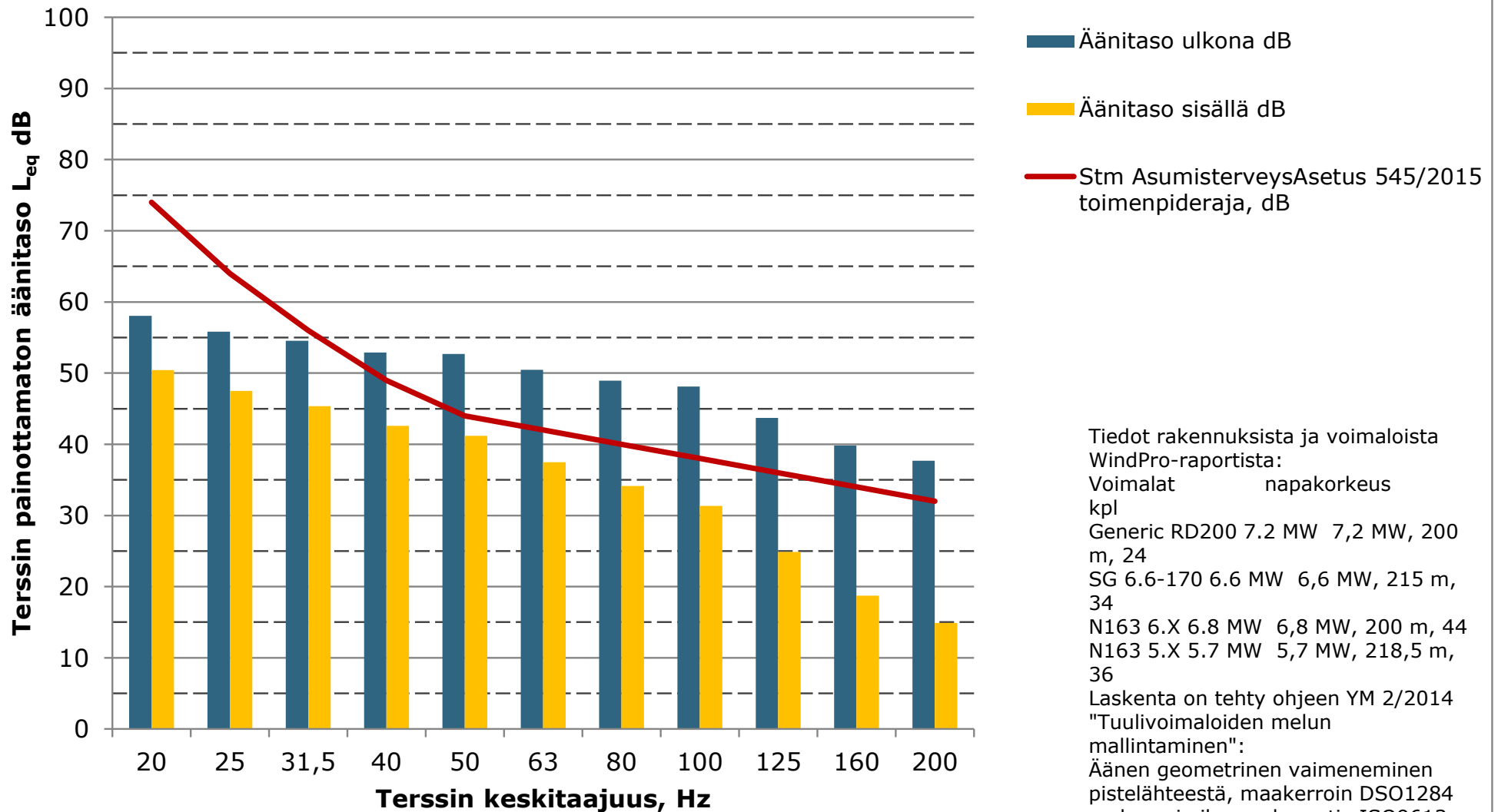
**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus Q
(Hautalehto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**



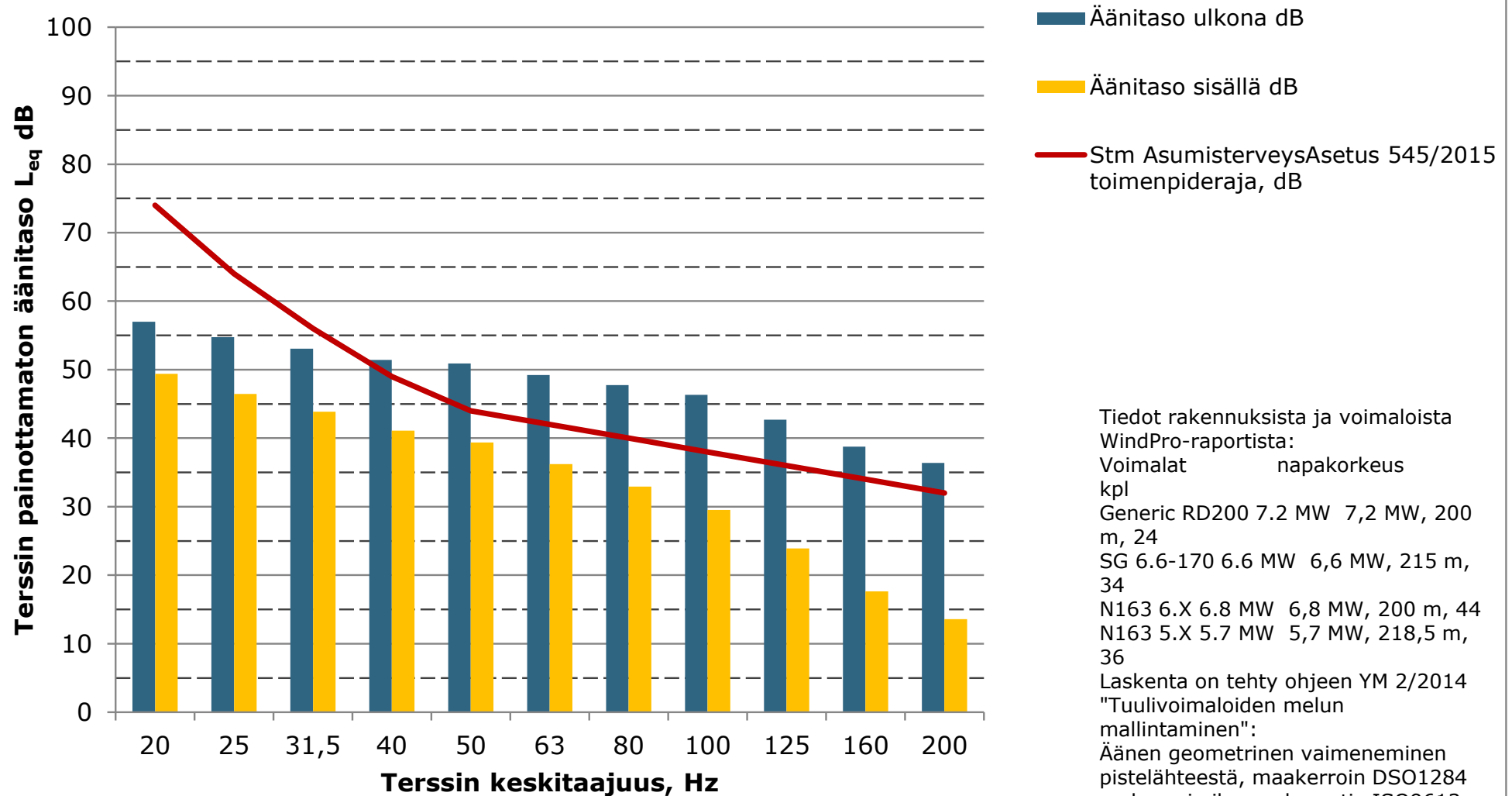
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus R
(Korpelanperä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus S (Myllymäki), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

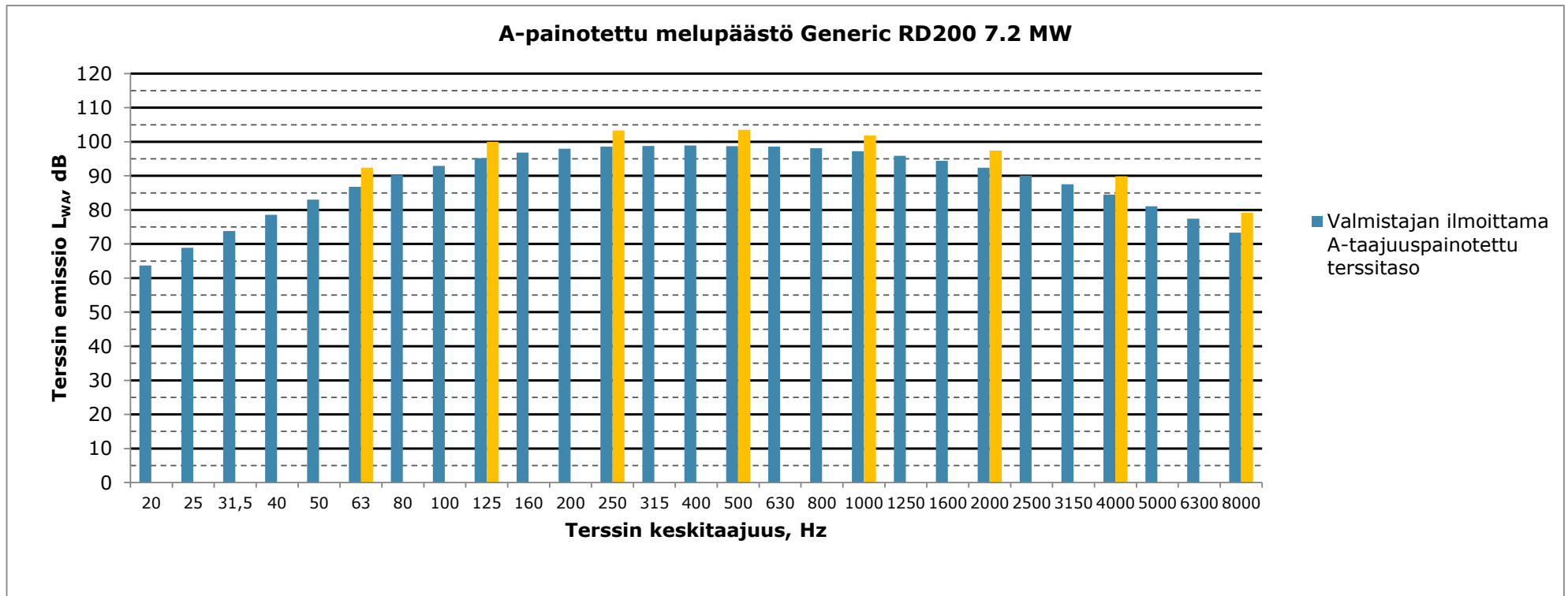


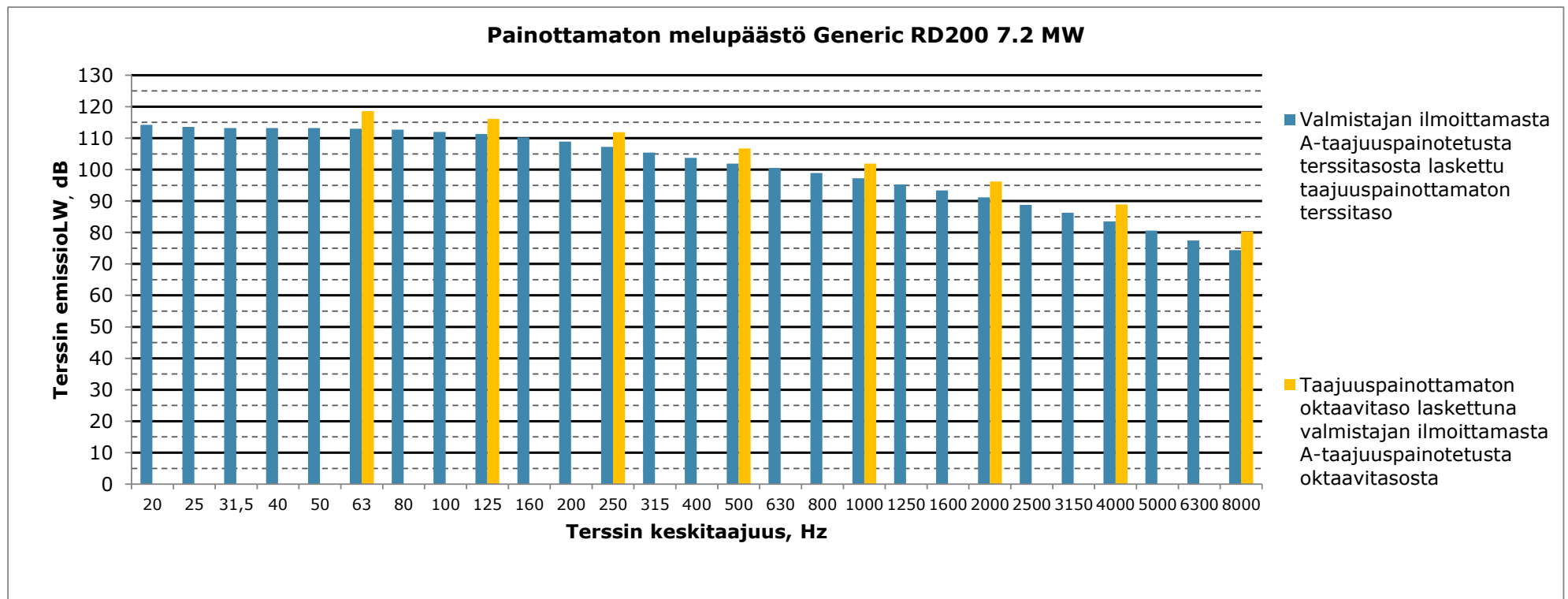
**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus T
(Kärsämäenneva), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**

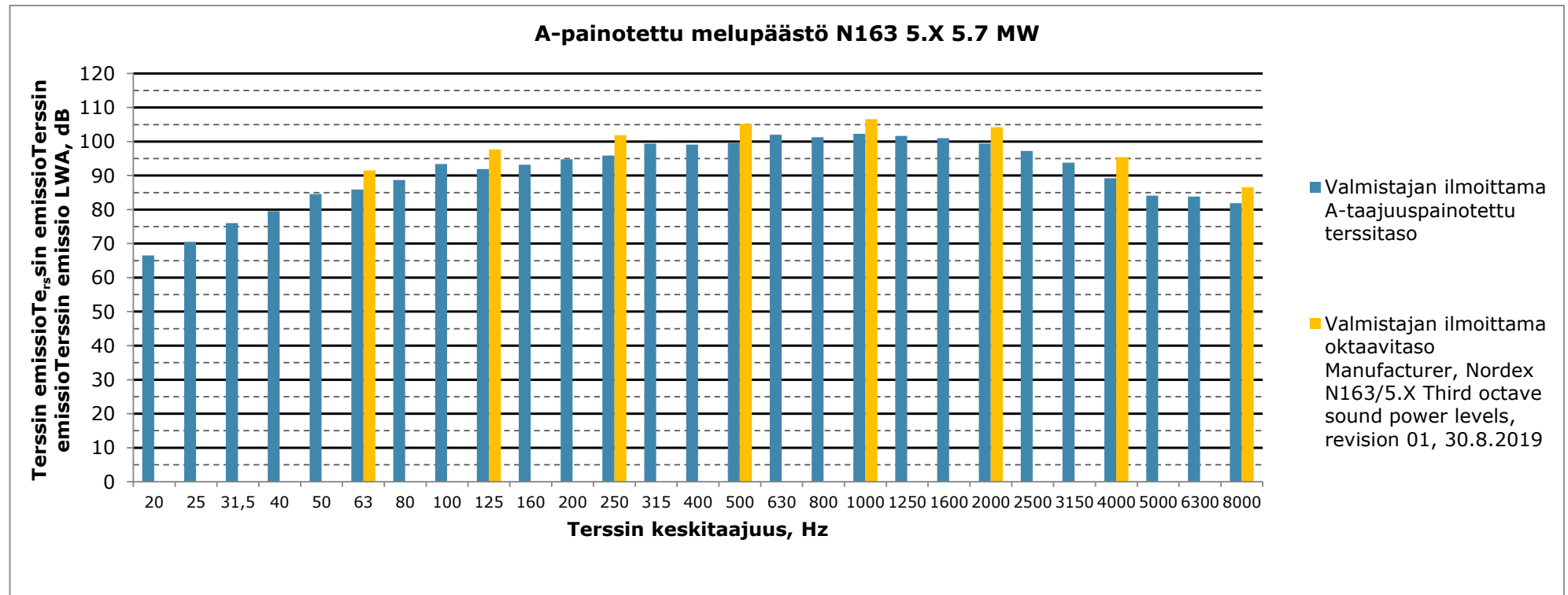


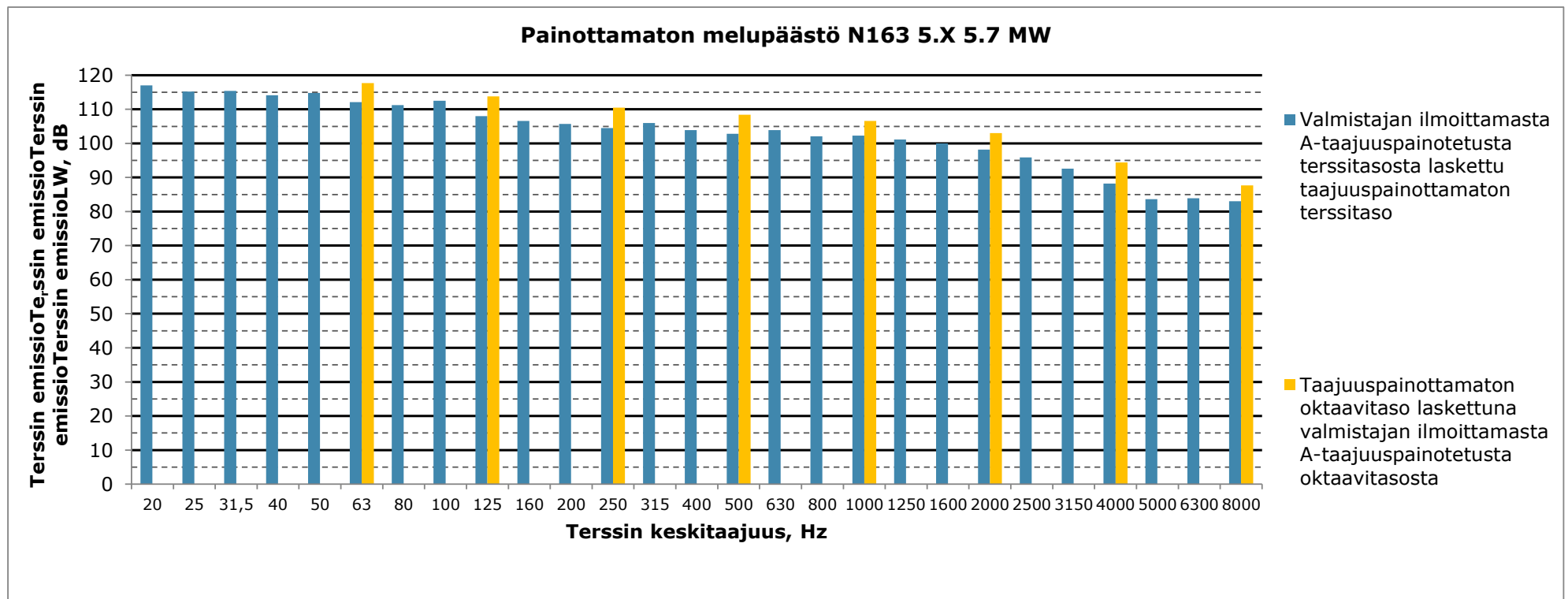
6.5.2024

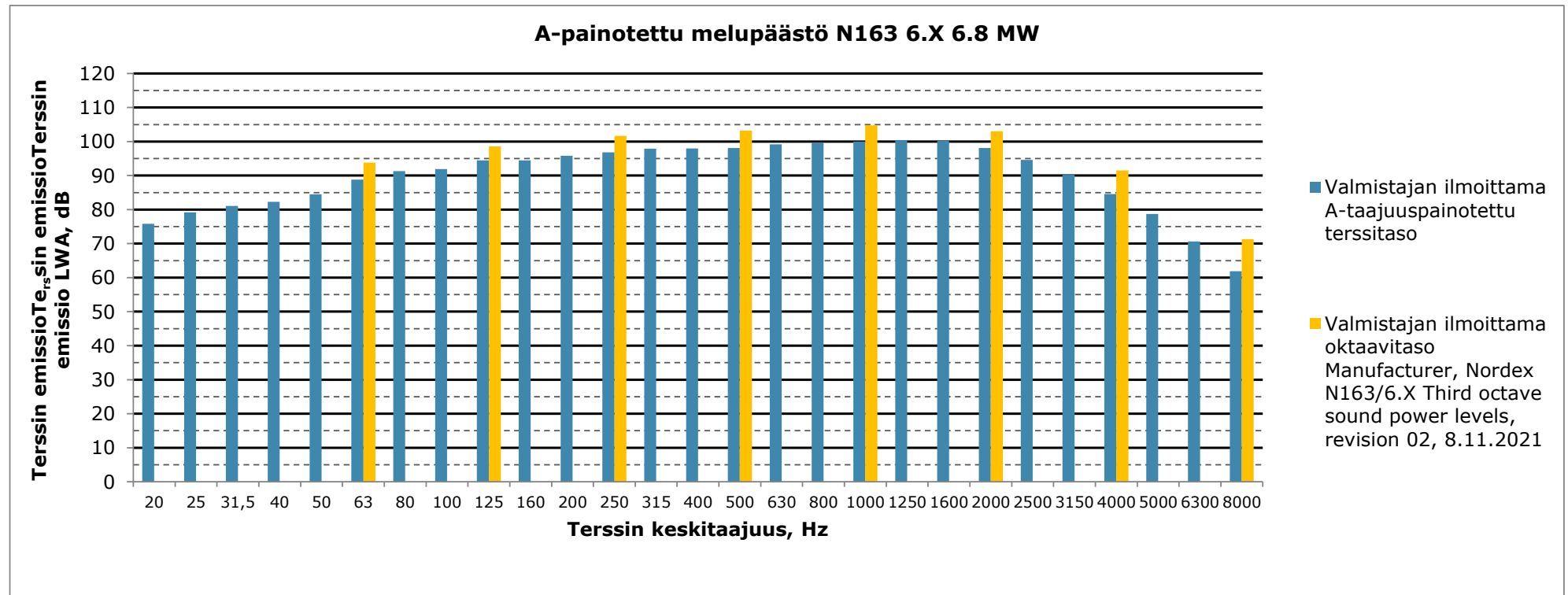
Liite 15. Matalataajuisen melun yhteisvaikutuksen rakennuskohtaiset arvot – Hankevaihtoehto 3 (VE3).

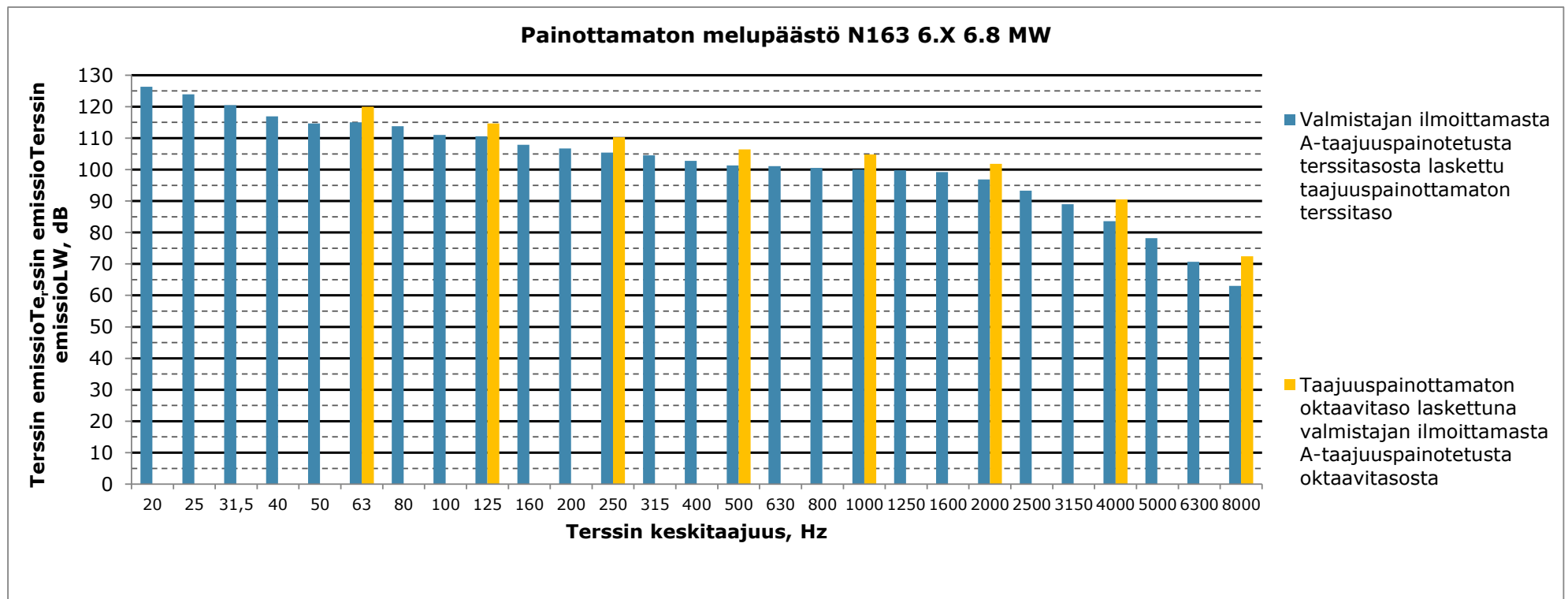


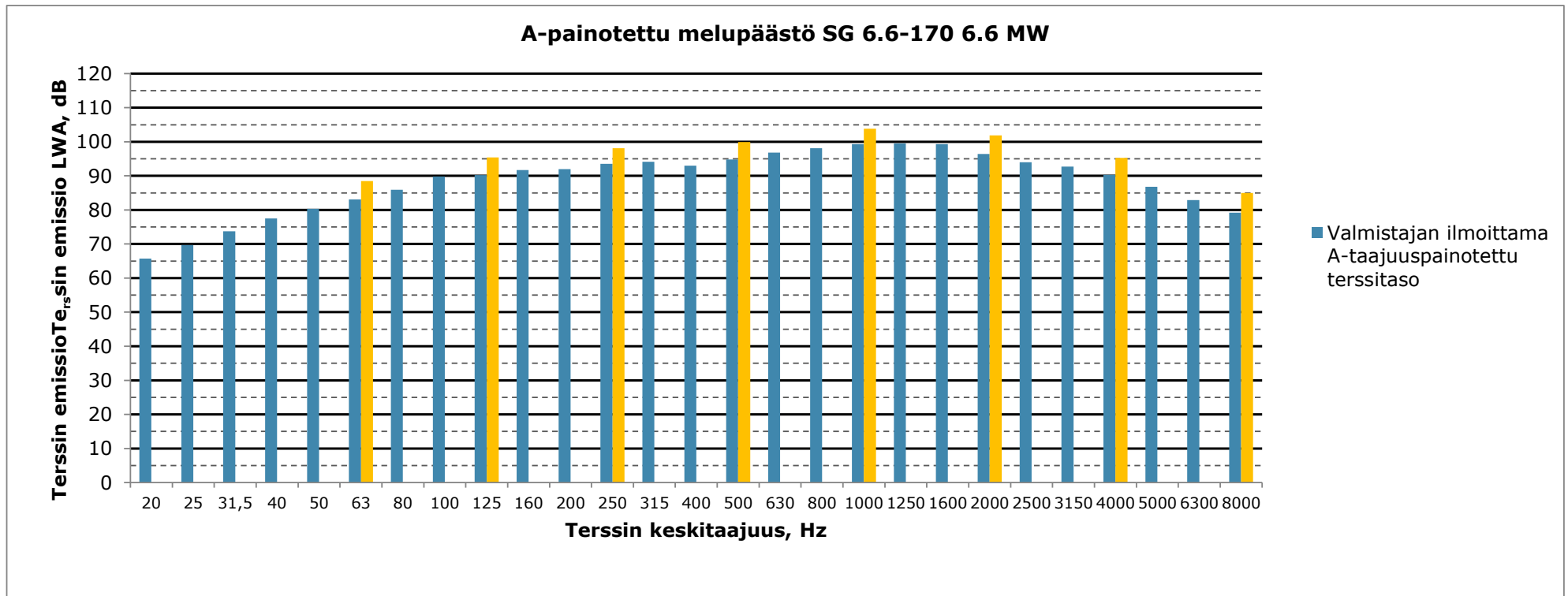


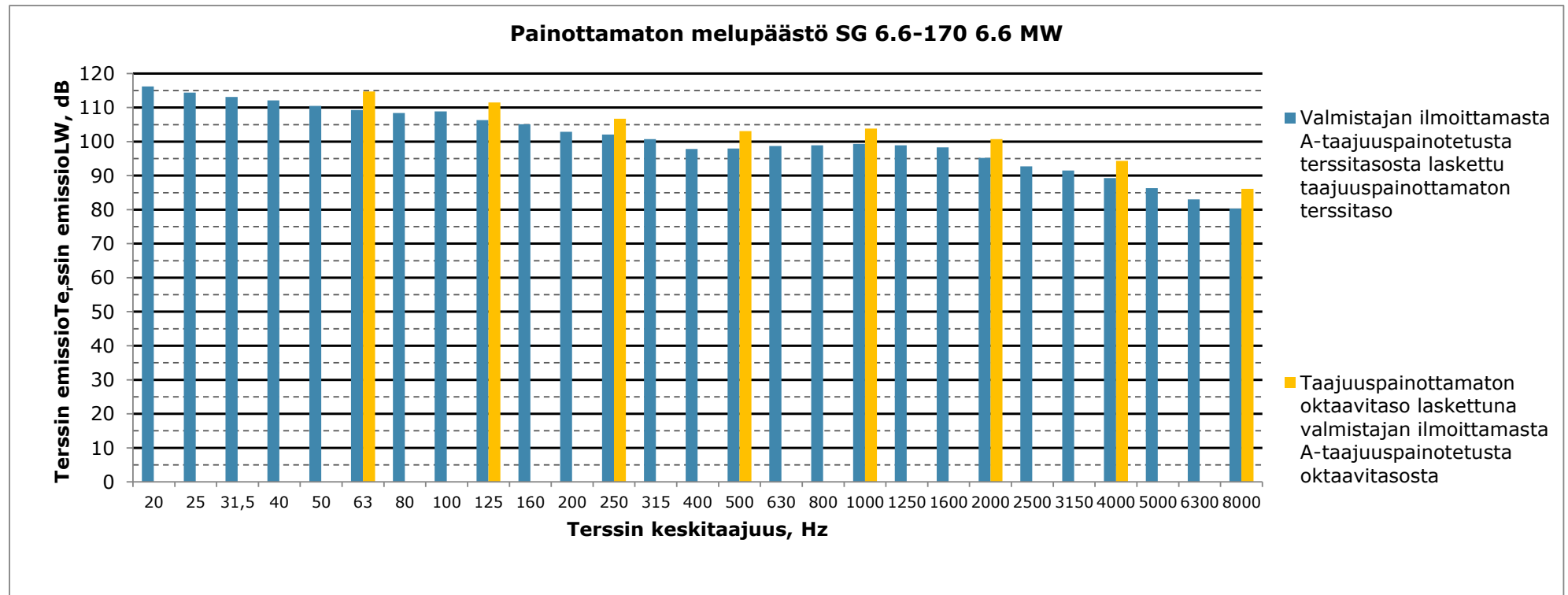


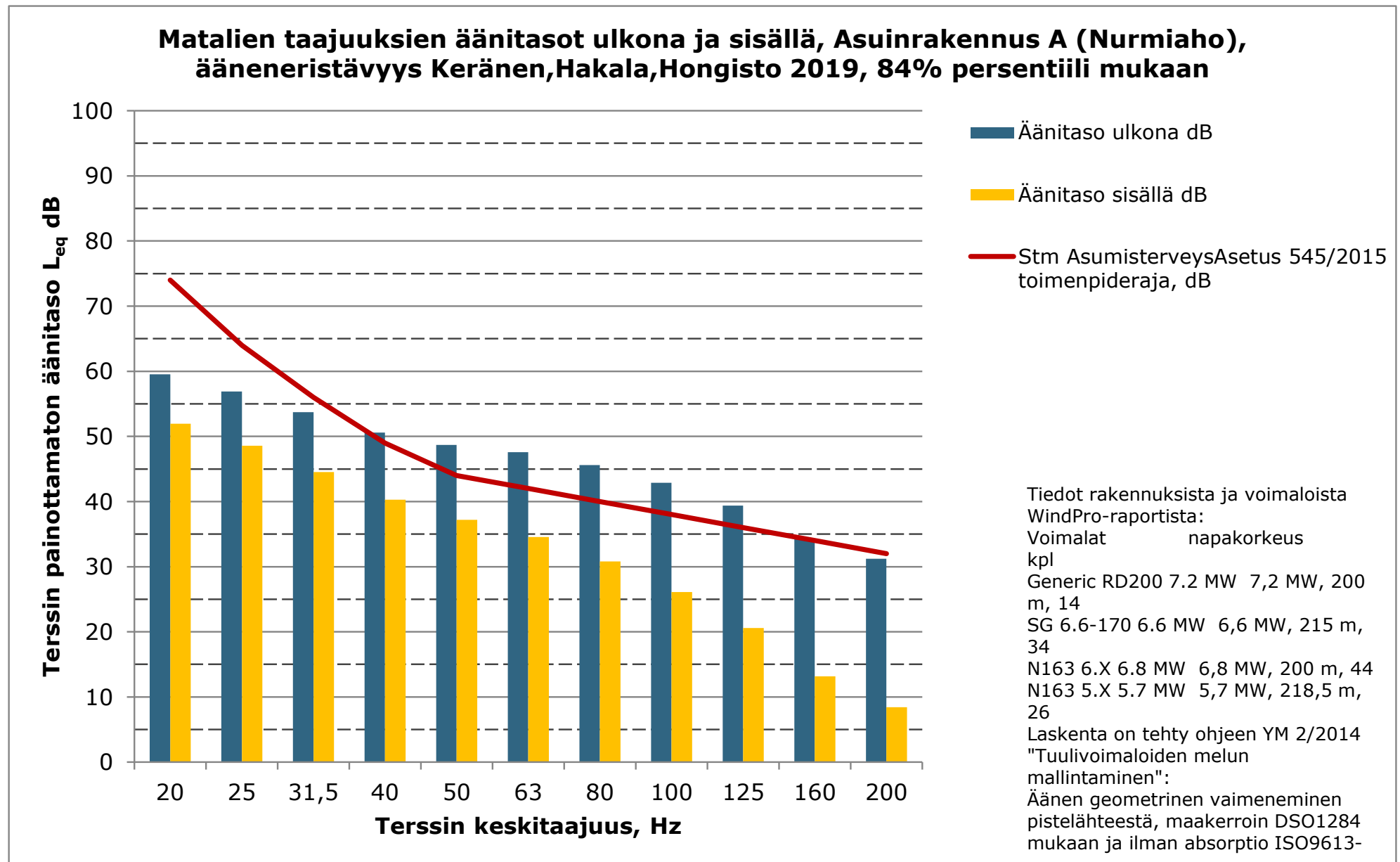




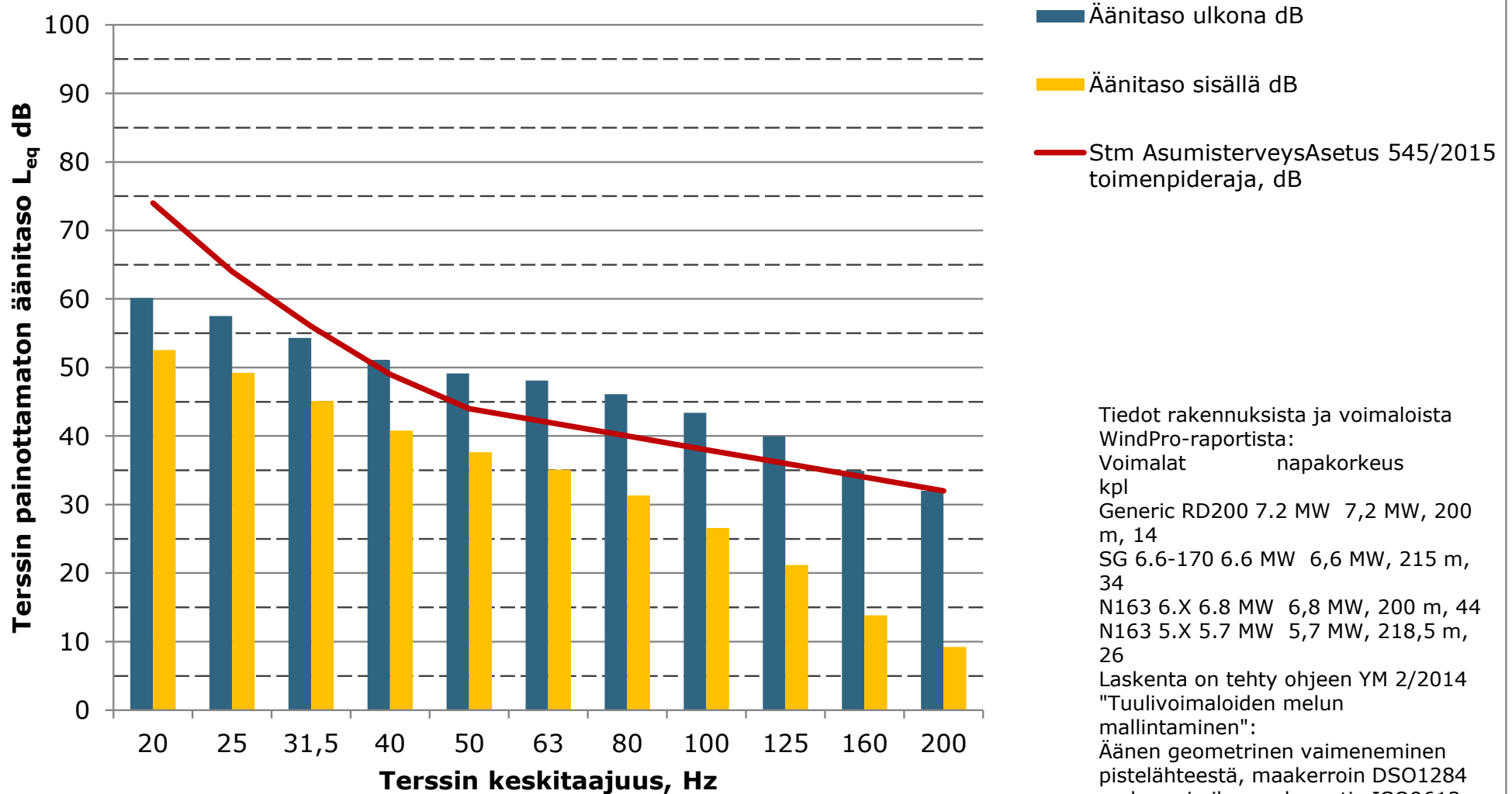


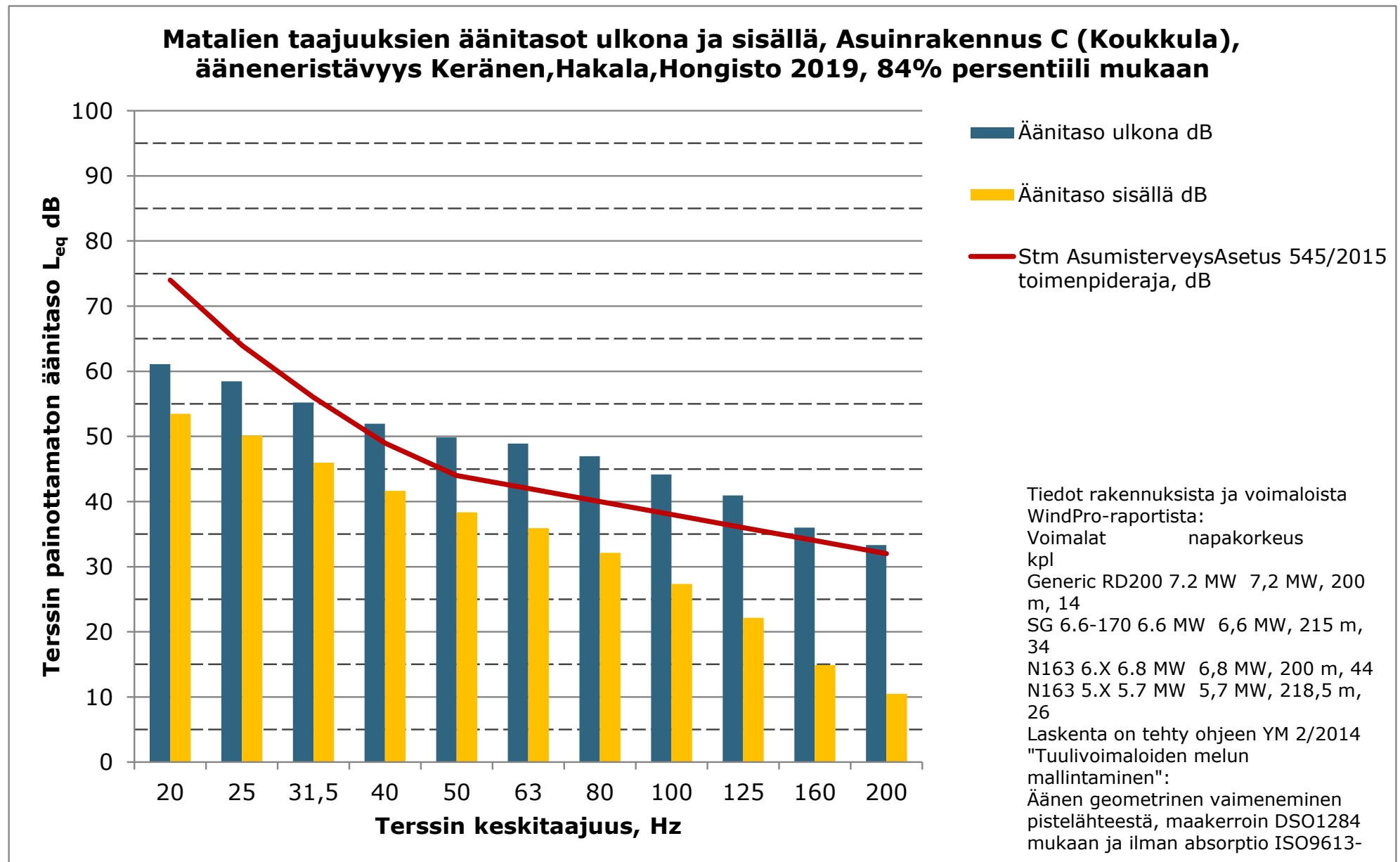




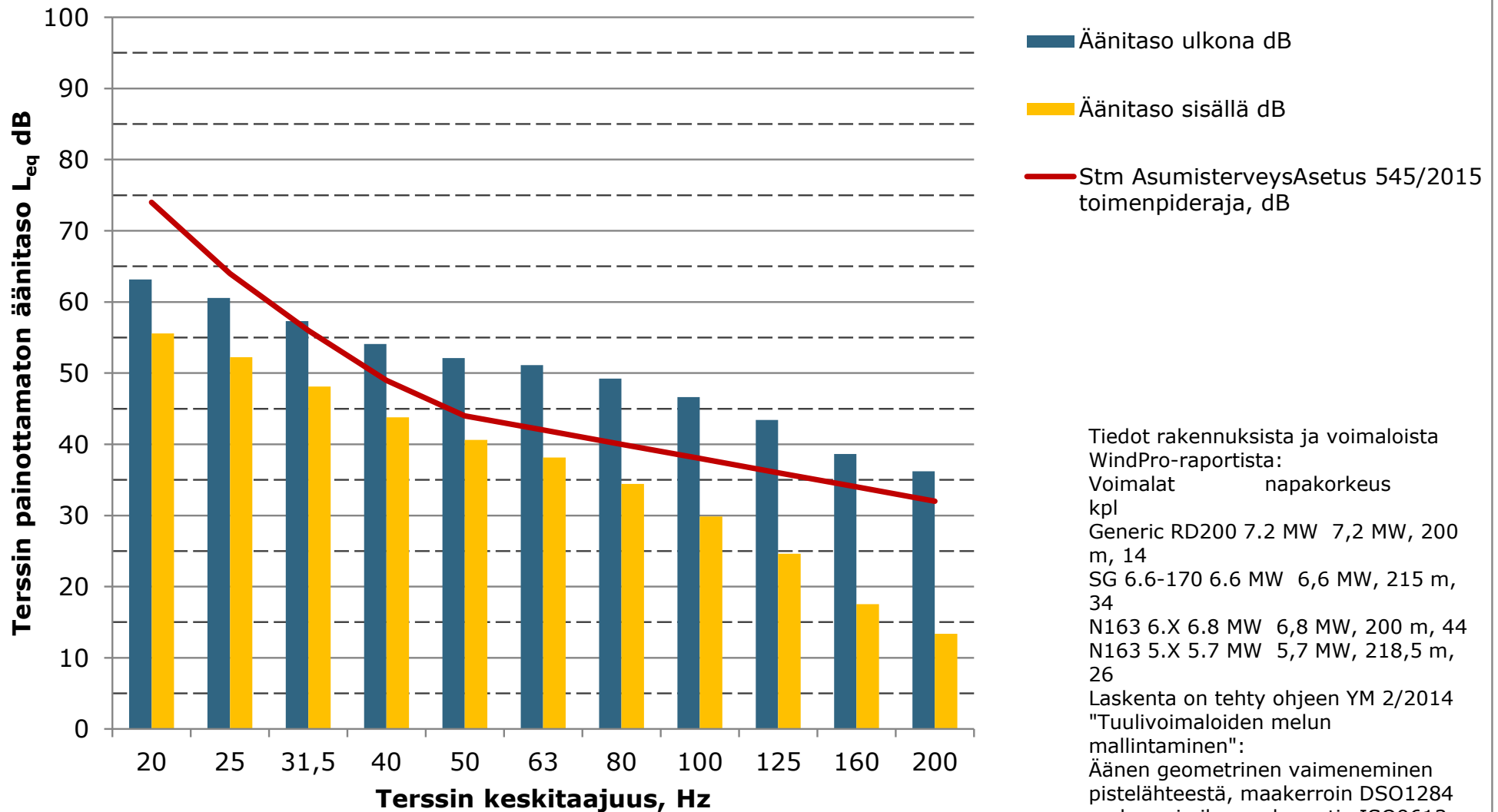


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus B
(Kivikangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili
mukaan**

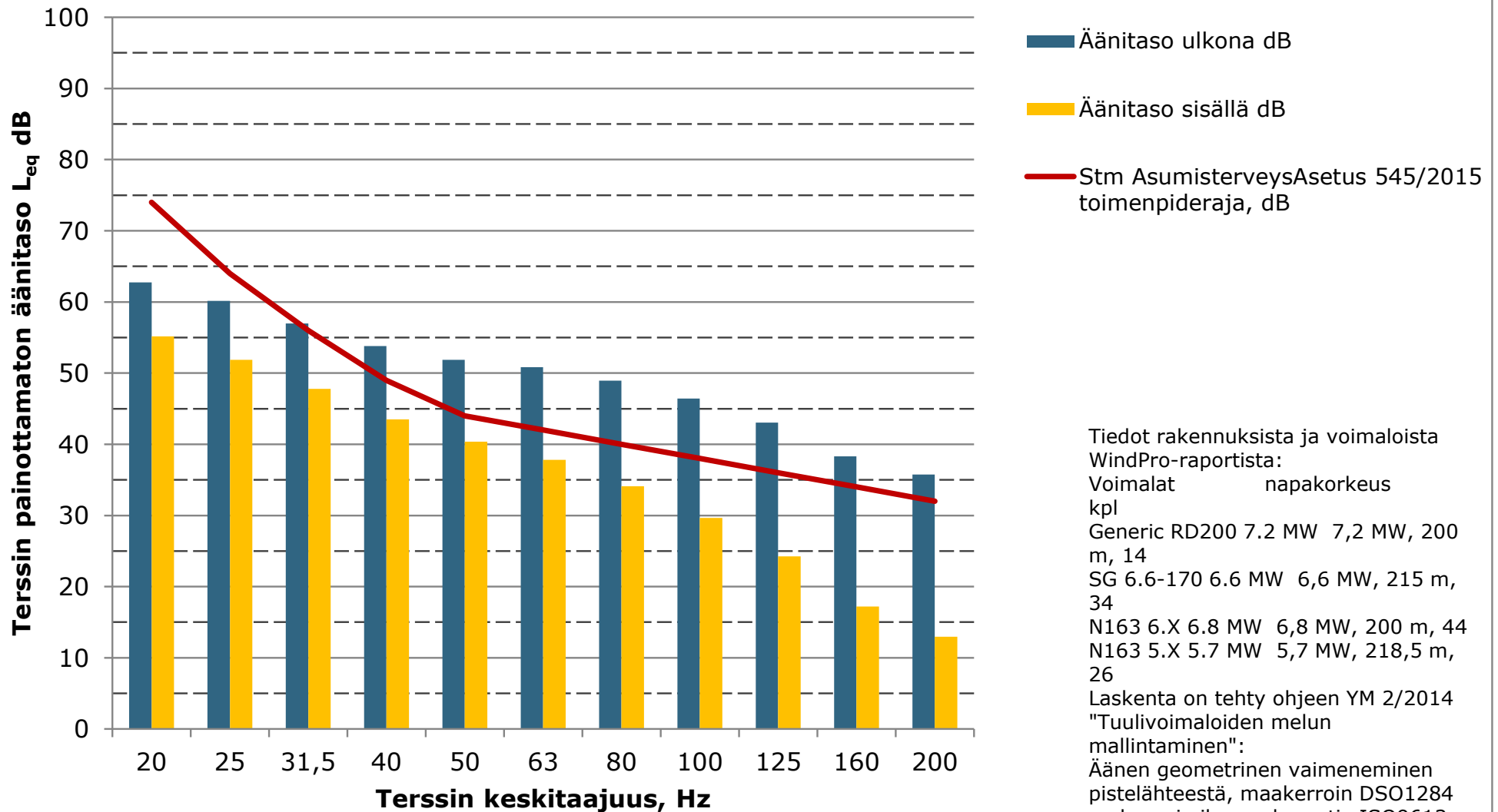




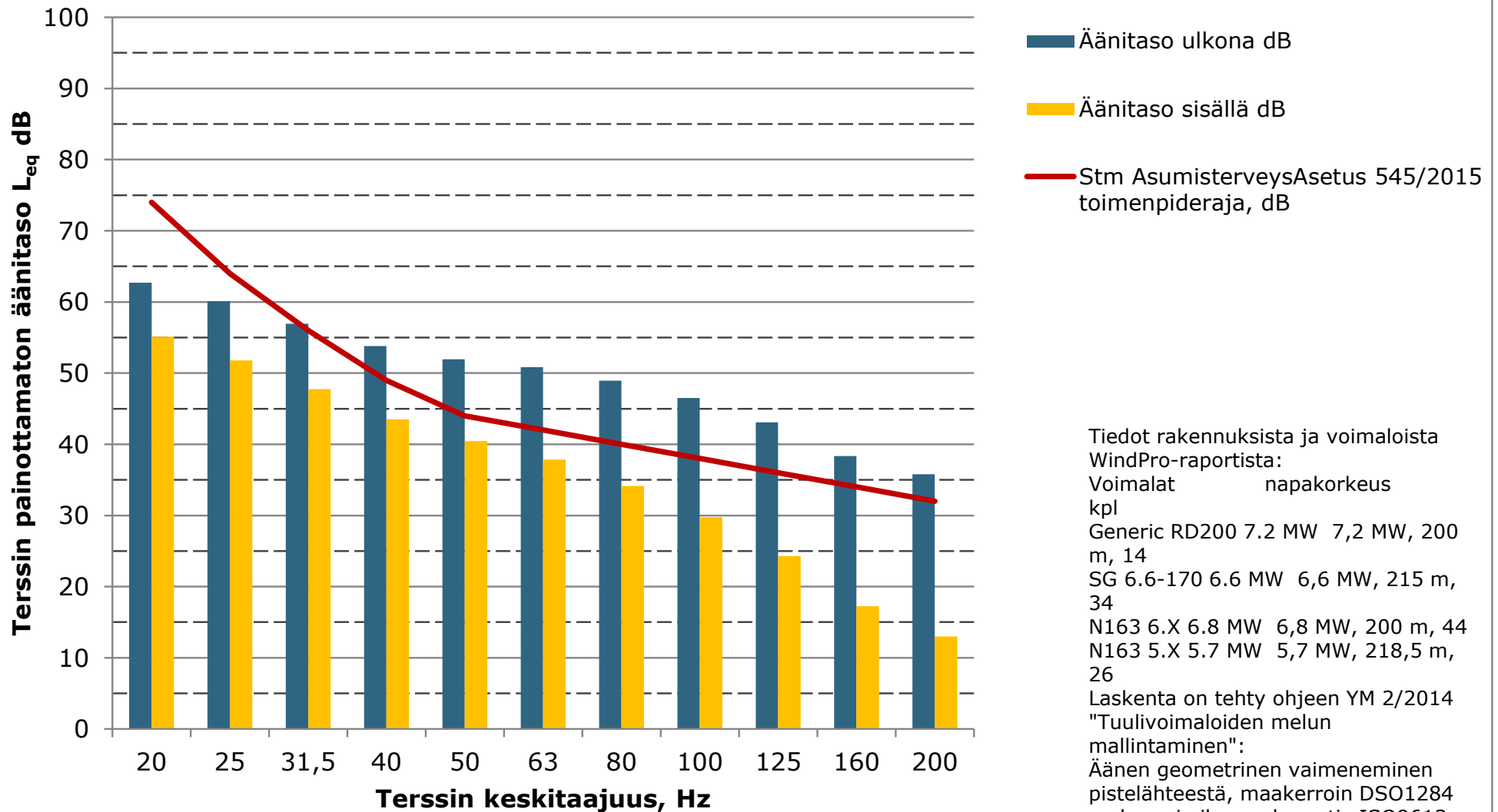
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus D (Konola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

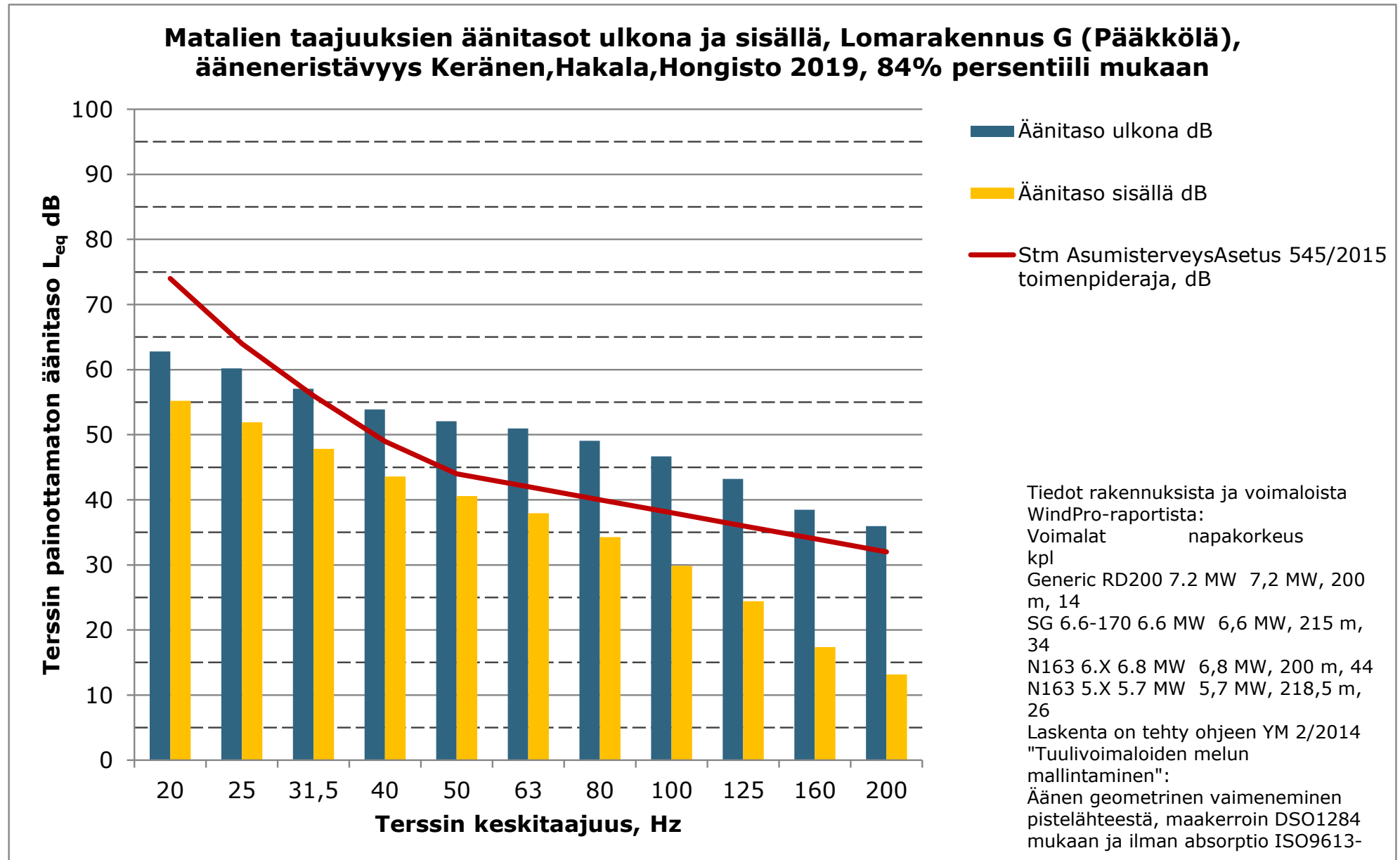


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus E (Piippo), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

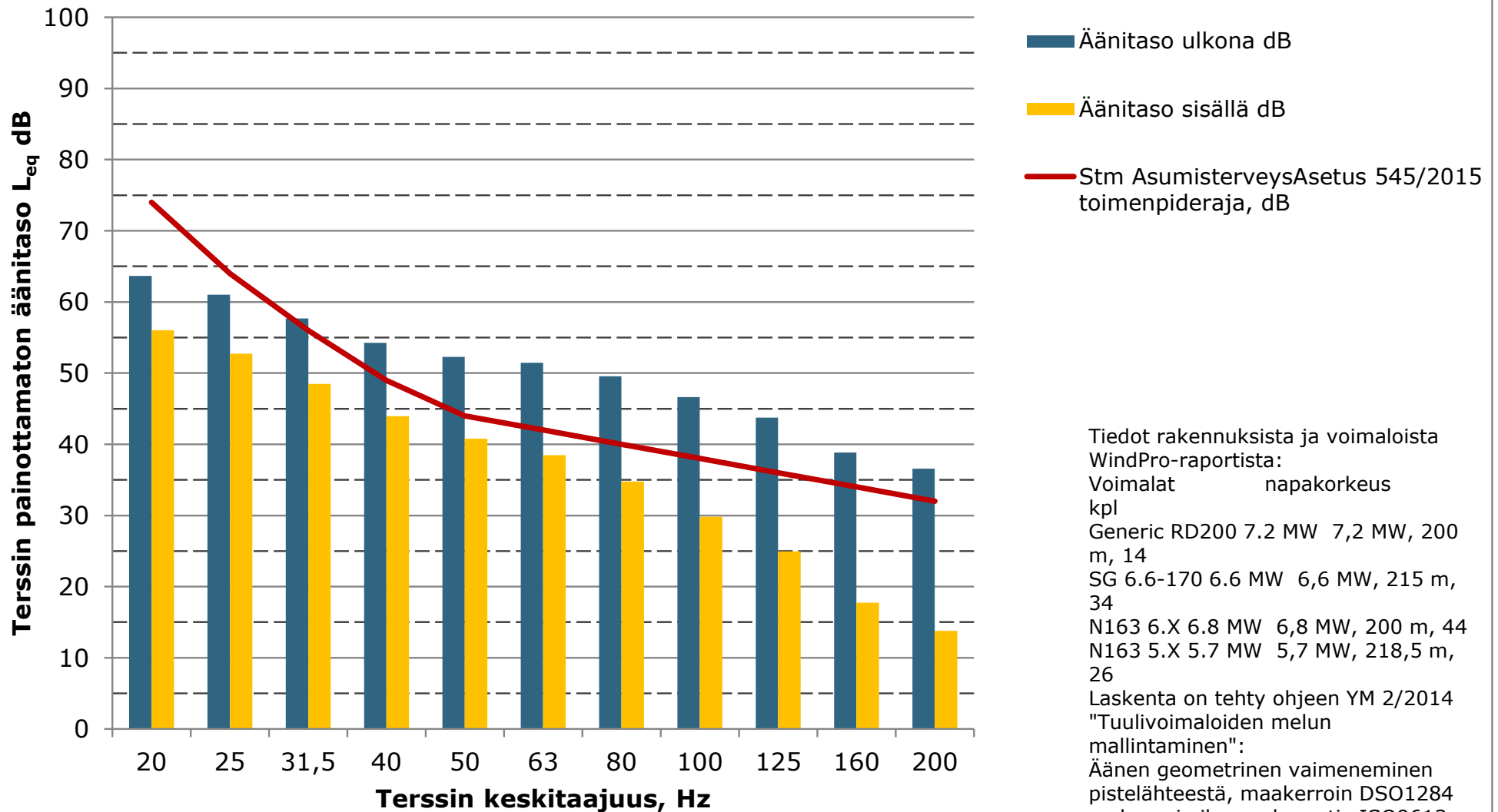


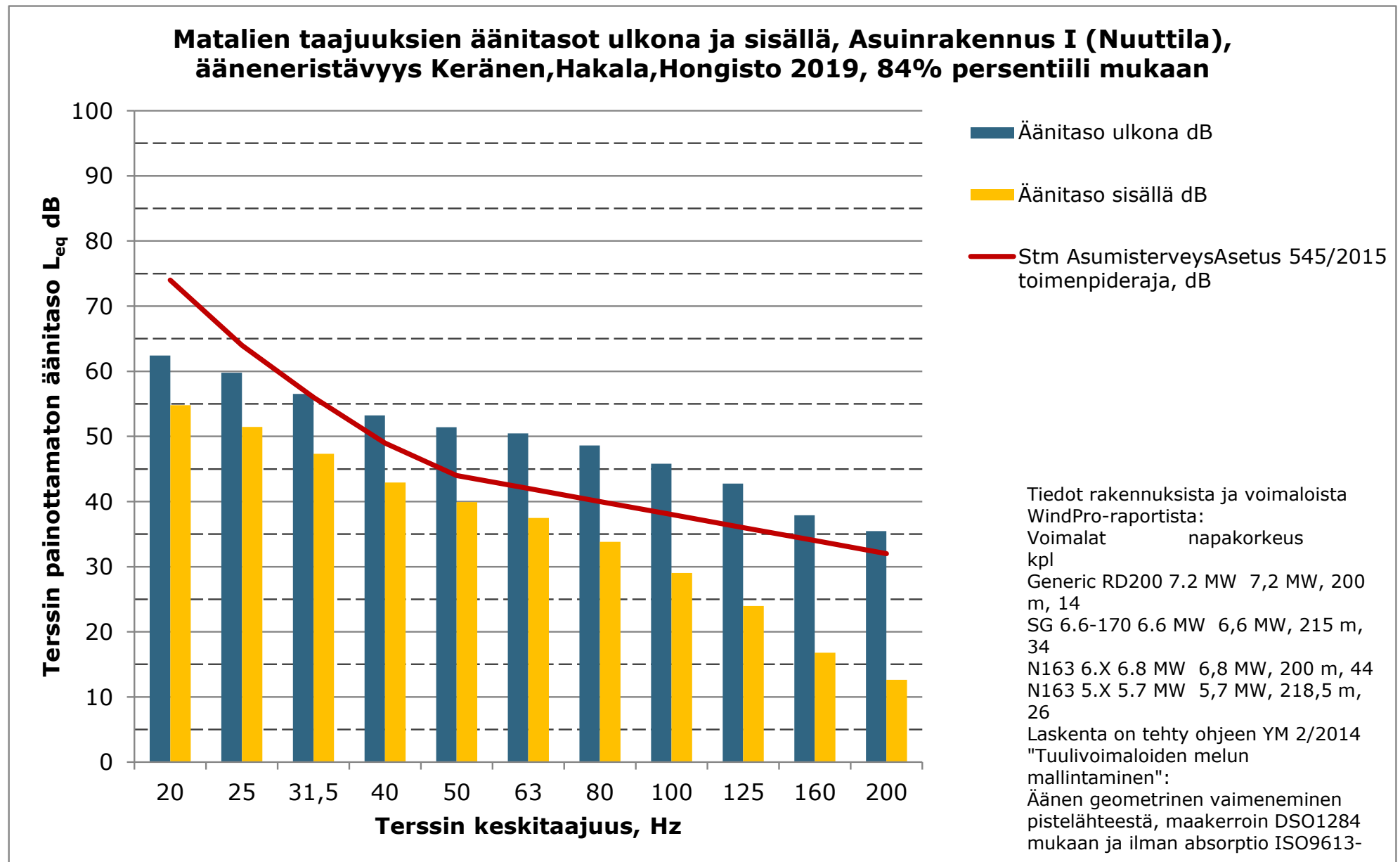
Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus F (Pääkkö), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan



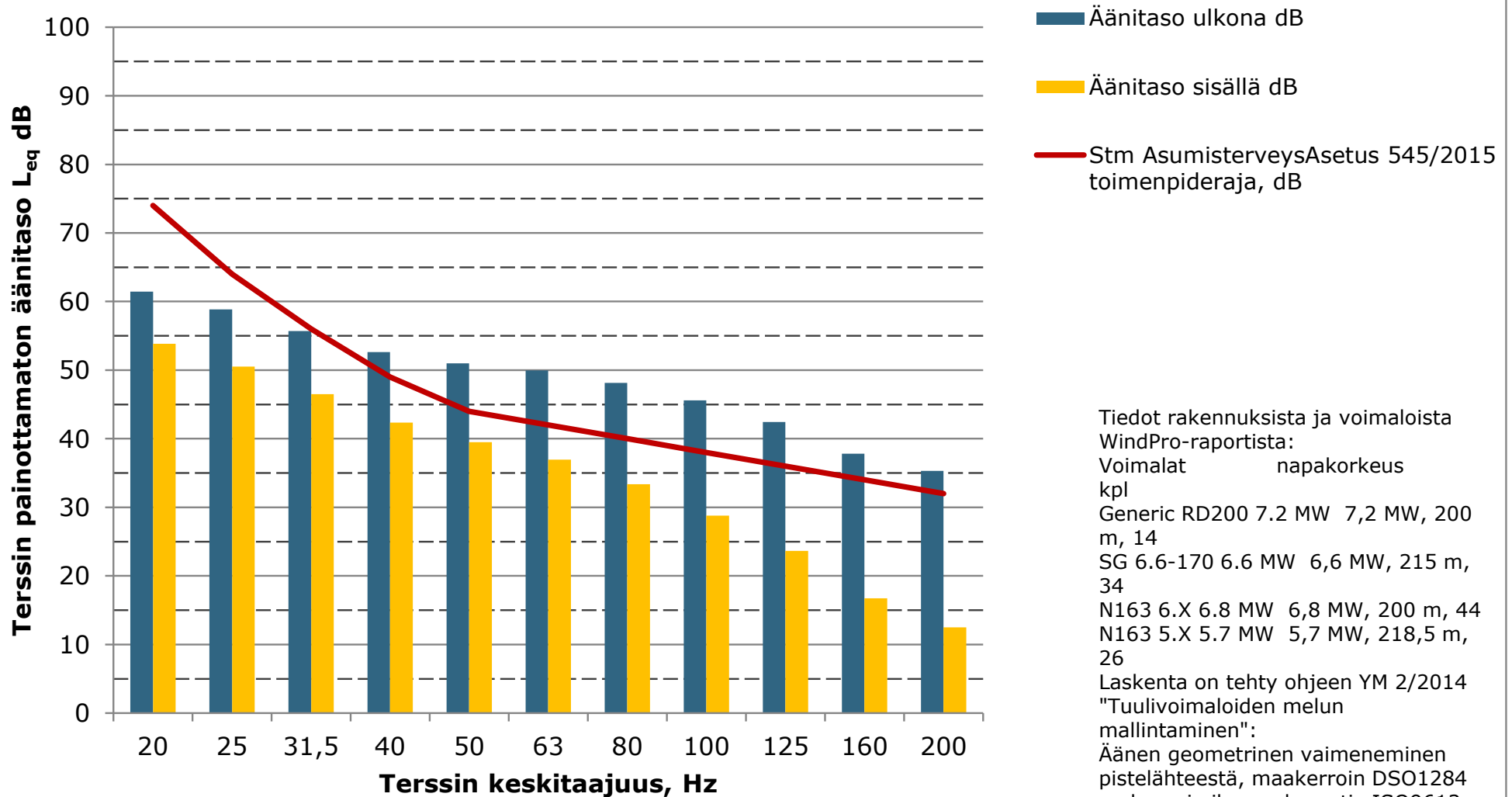


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus H (Peltola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

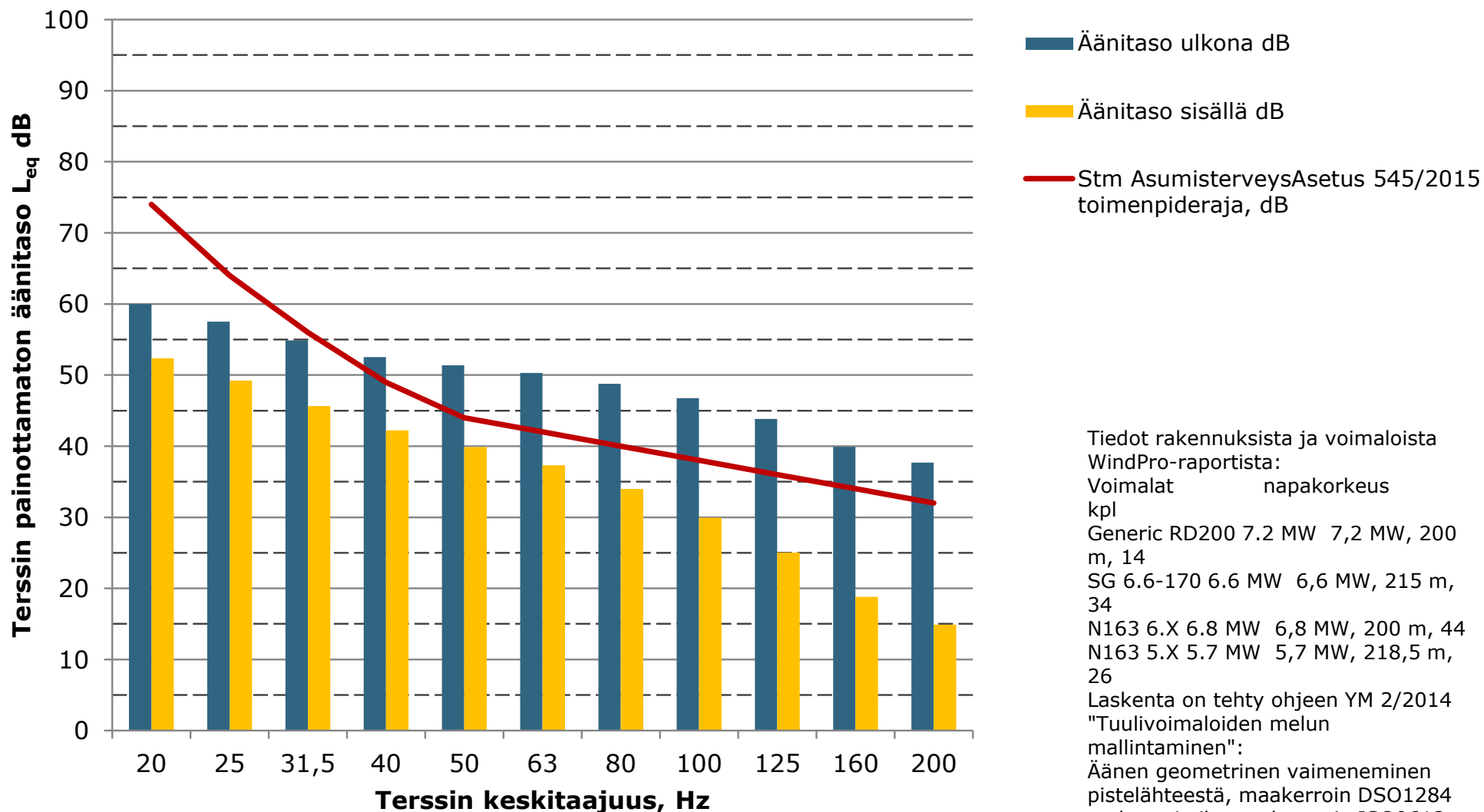


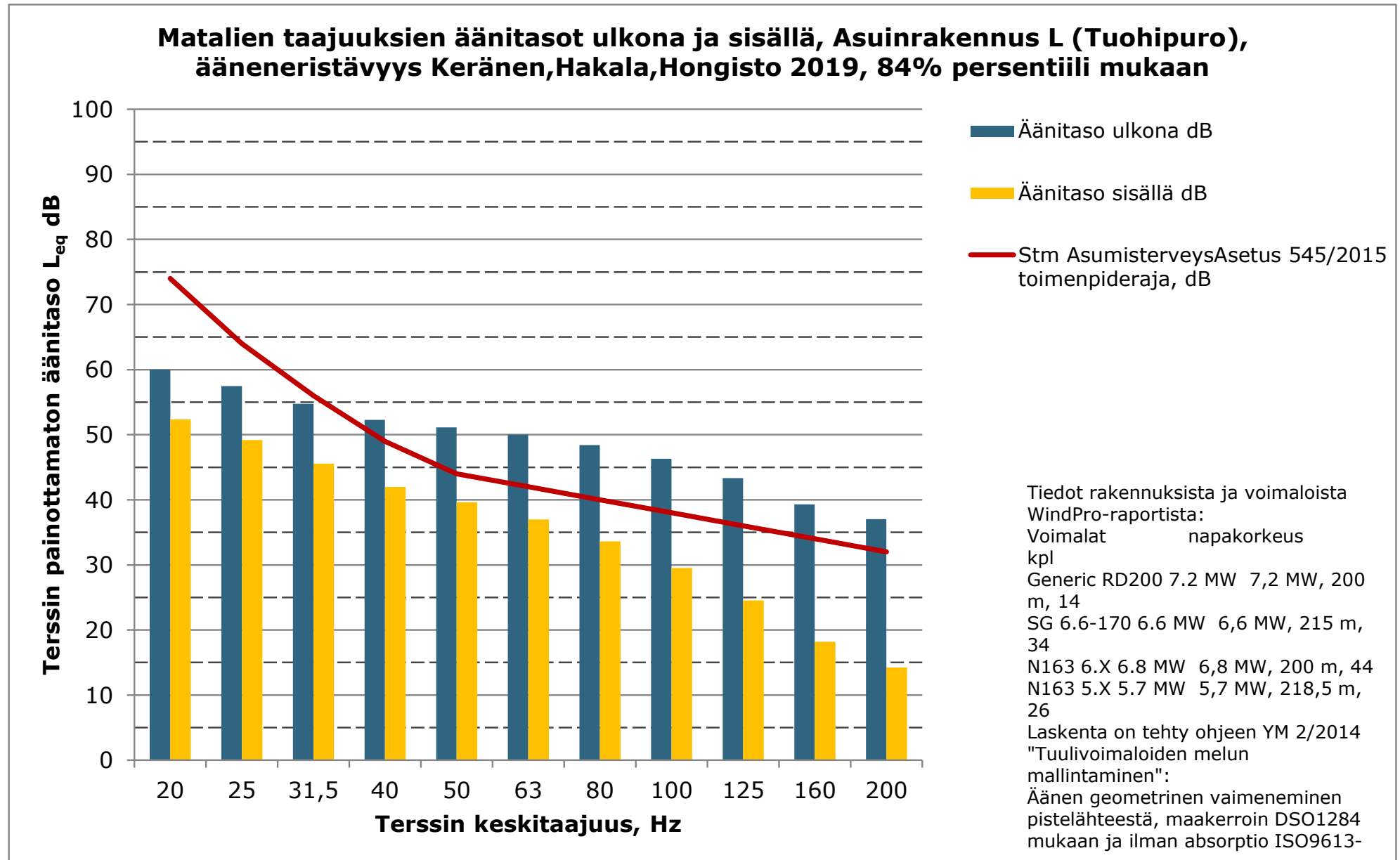


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus J
(Ahmokangas), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**

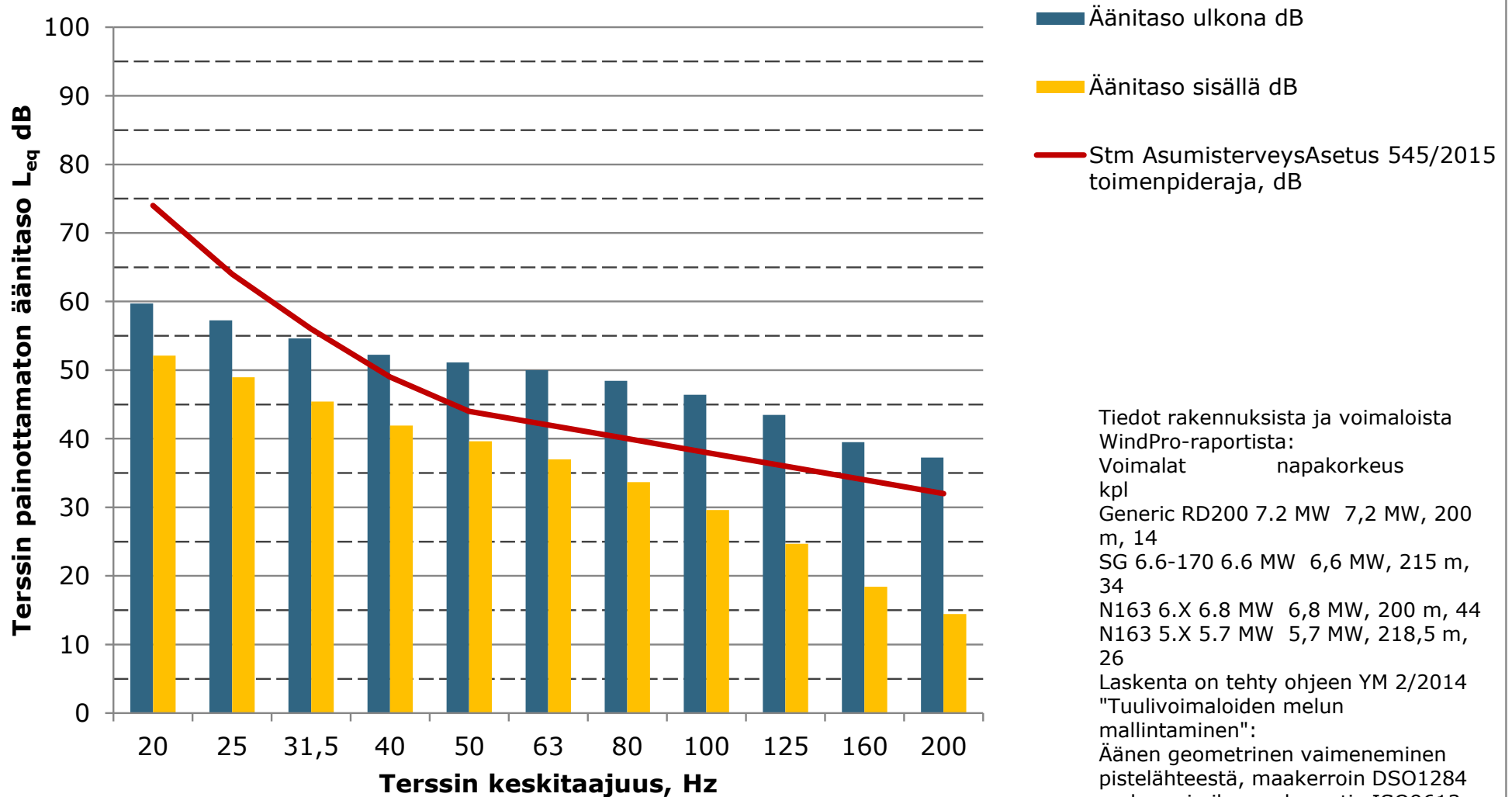


Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus K (Ketola), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

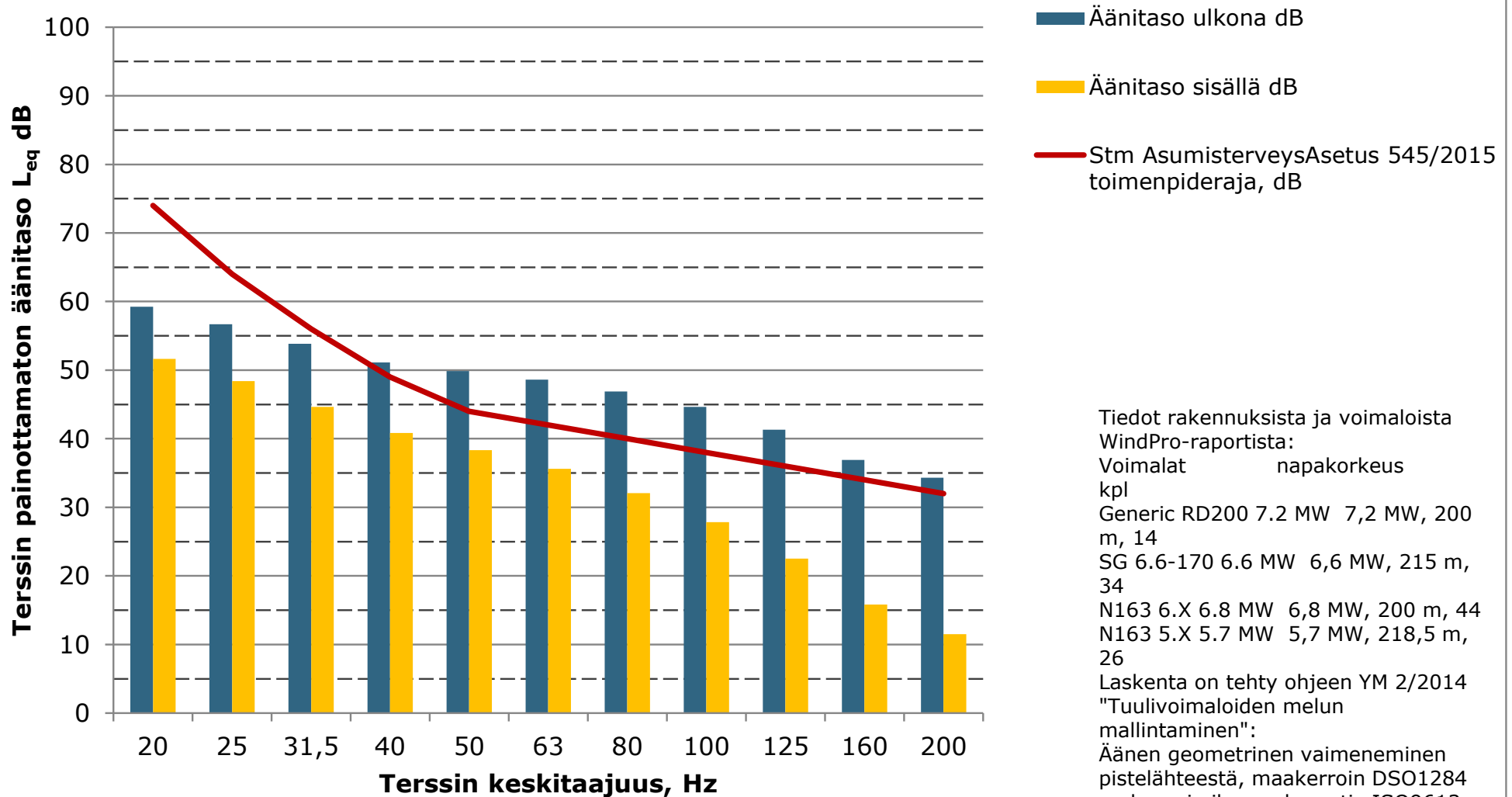


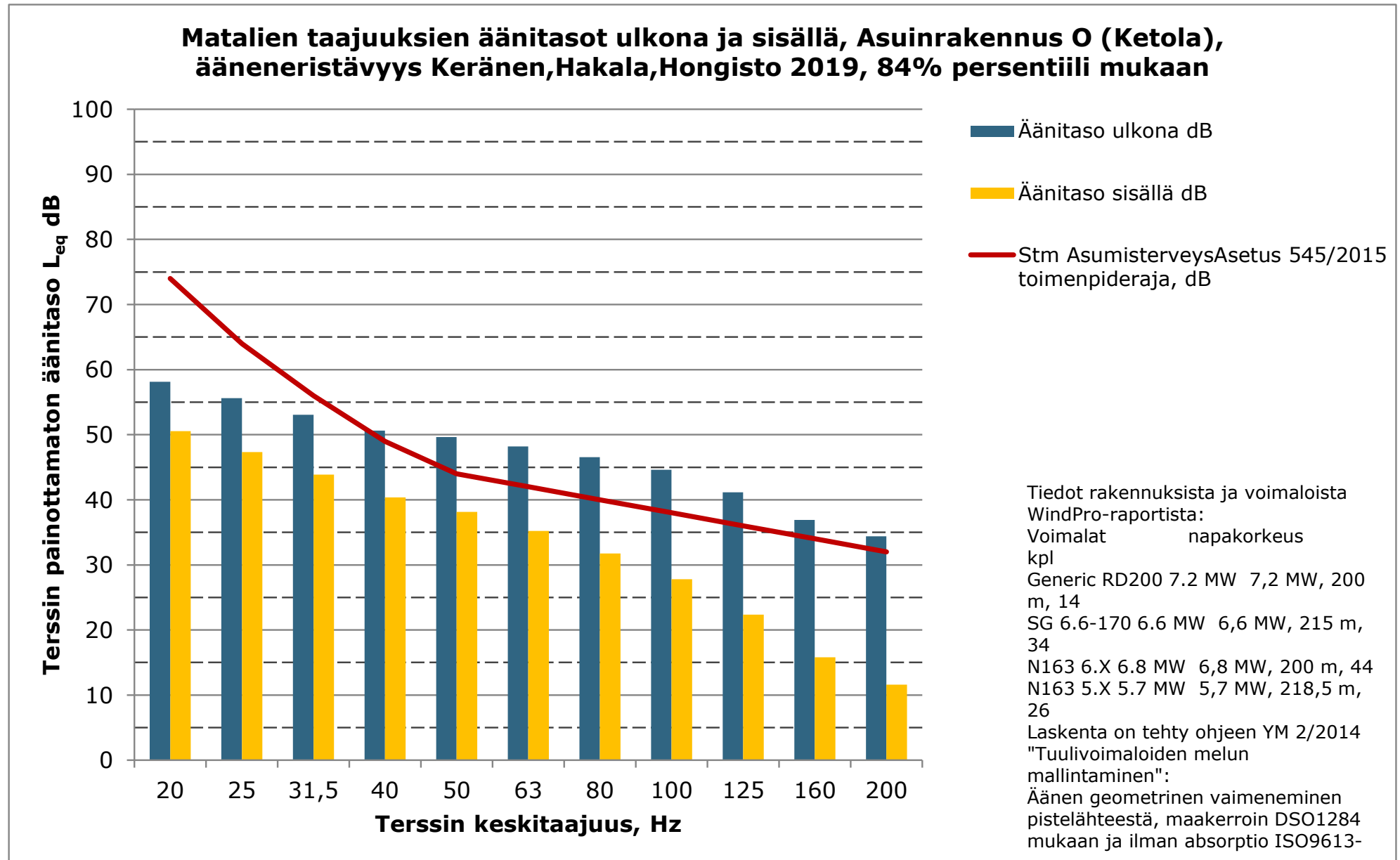


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus M
(Pilpanperä), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili
mukaan**

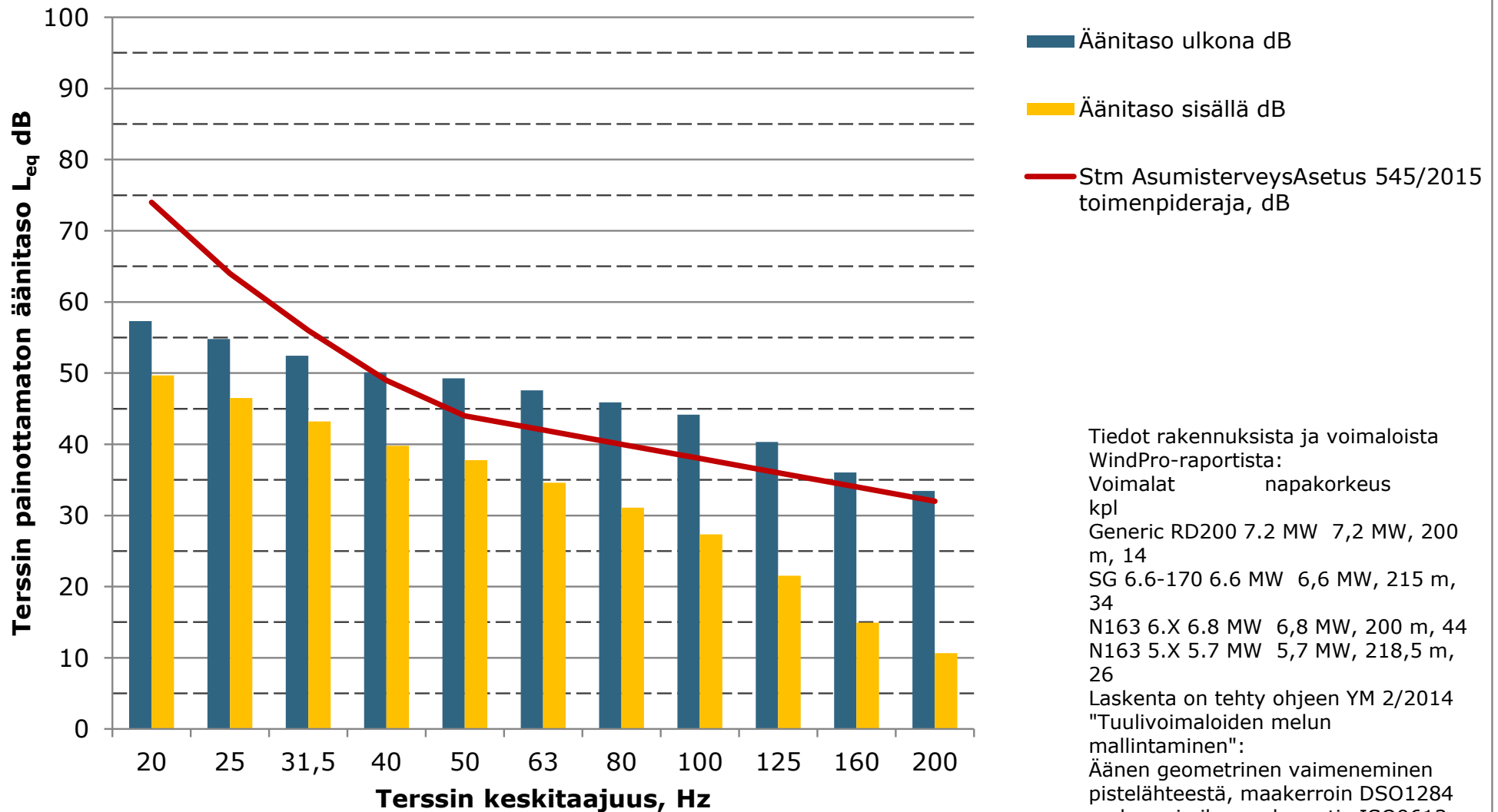


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus N
(Hanhikaarto), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**

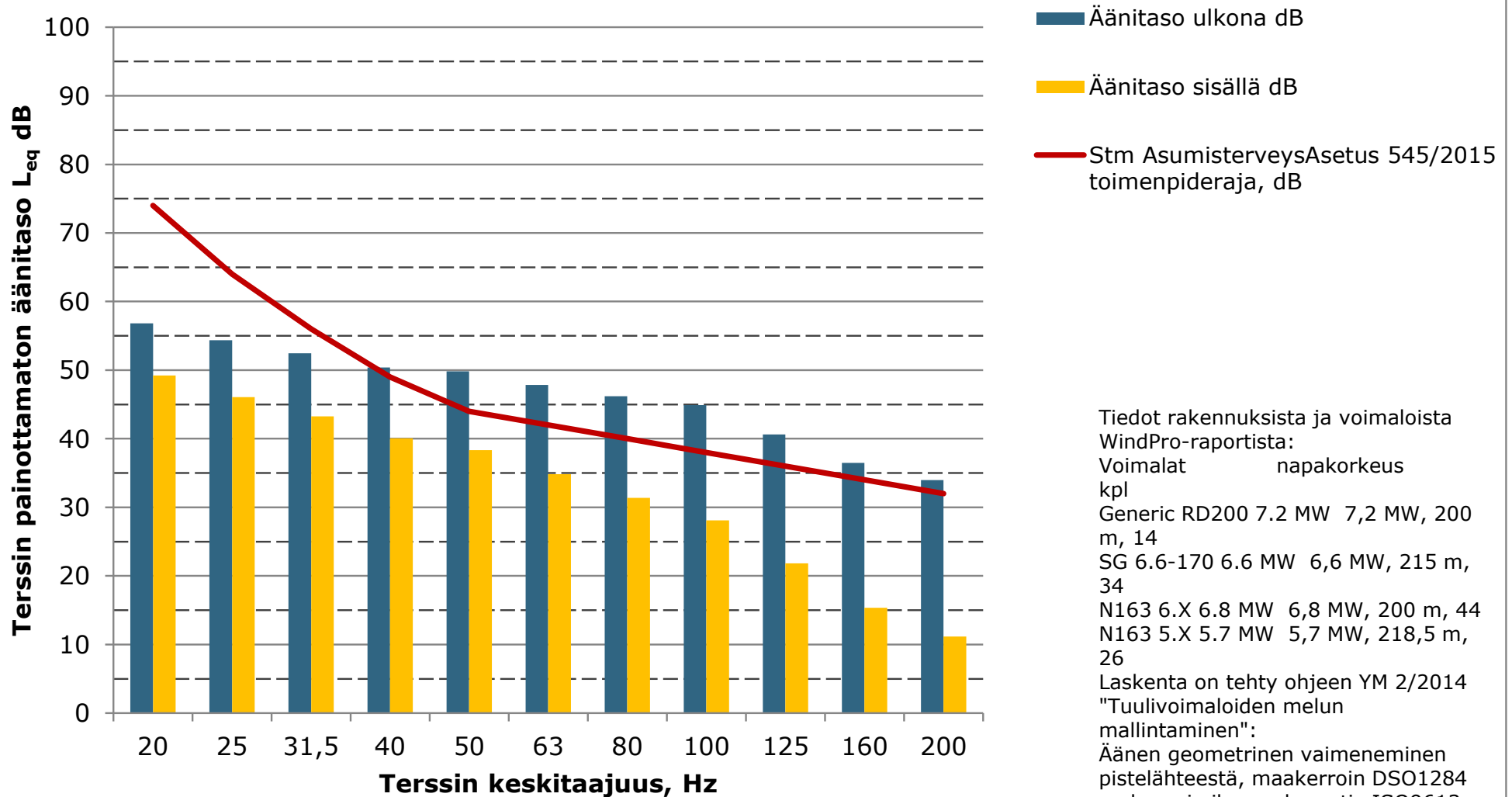




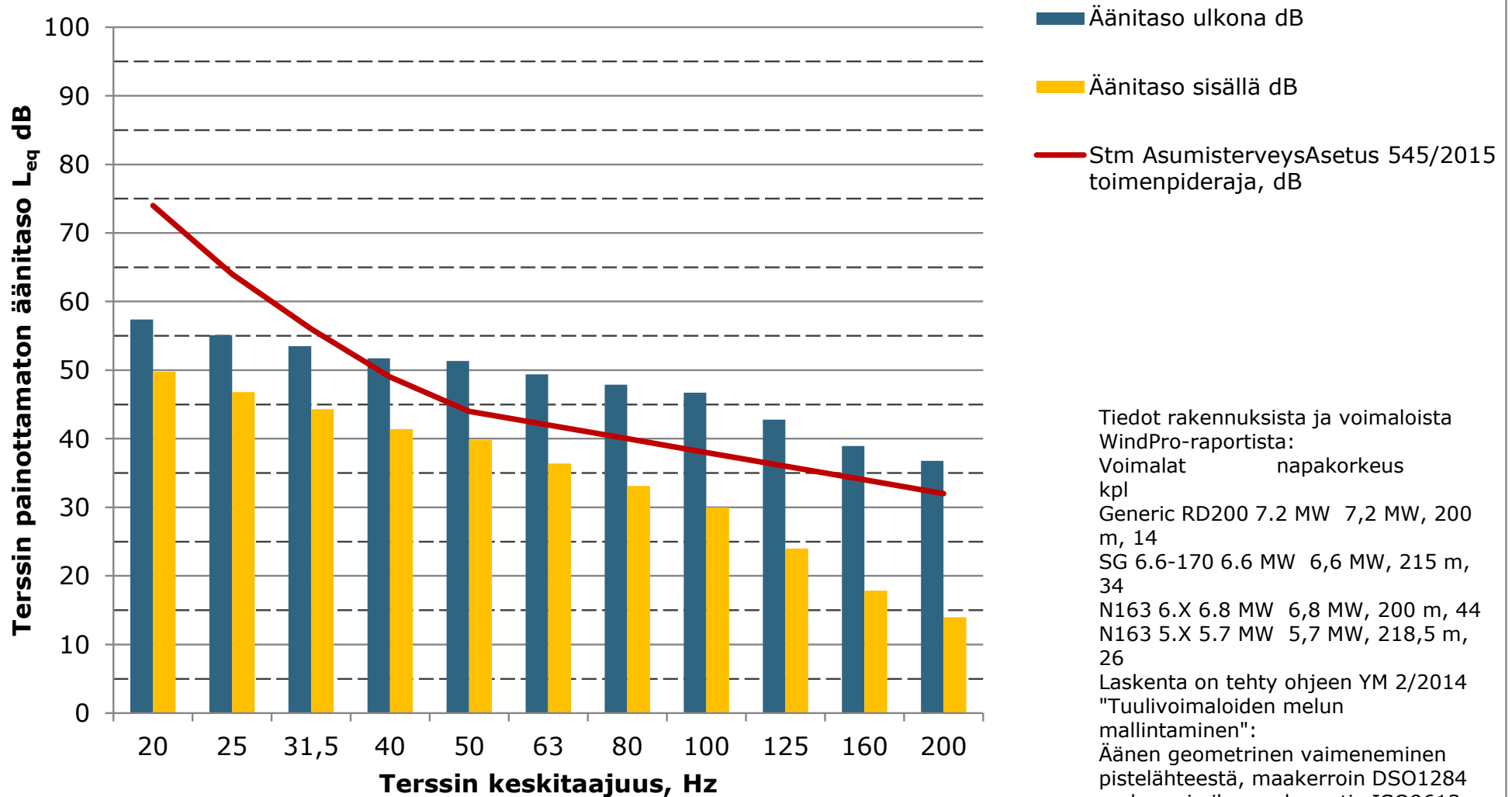
Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus P (Kuistila), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan

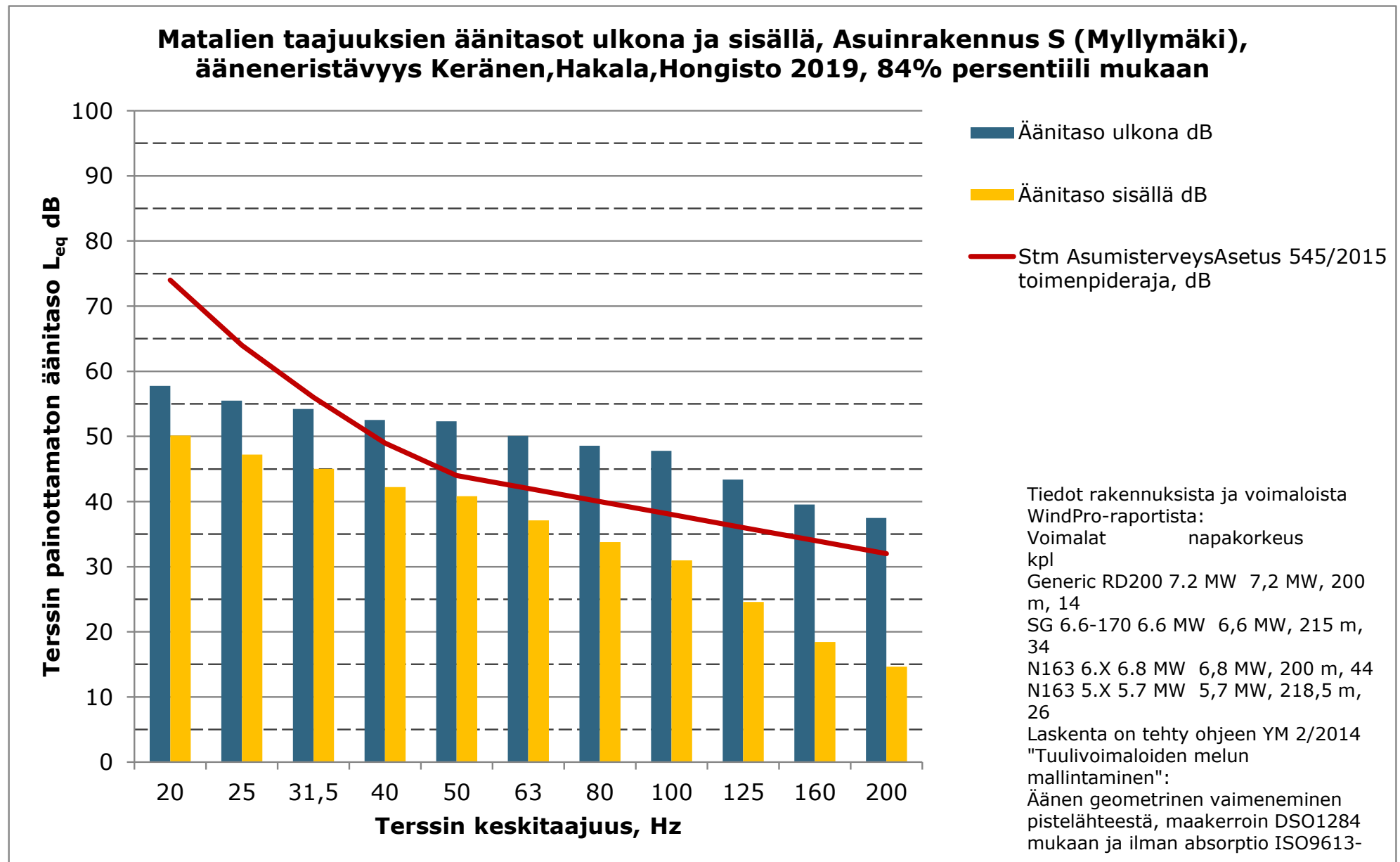


**Matalien taajuuksien äänitasot ulkona ja sisällä, Asuinrakennus Q
(Hautalehto), ääneneristävyys Keränen, Hakala, Hongisto 2019, 84% persentiili
mukaan**

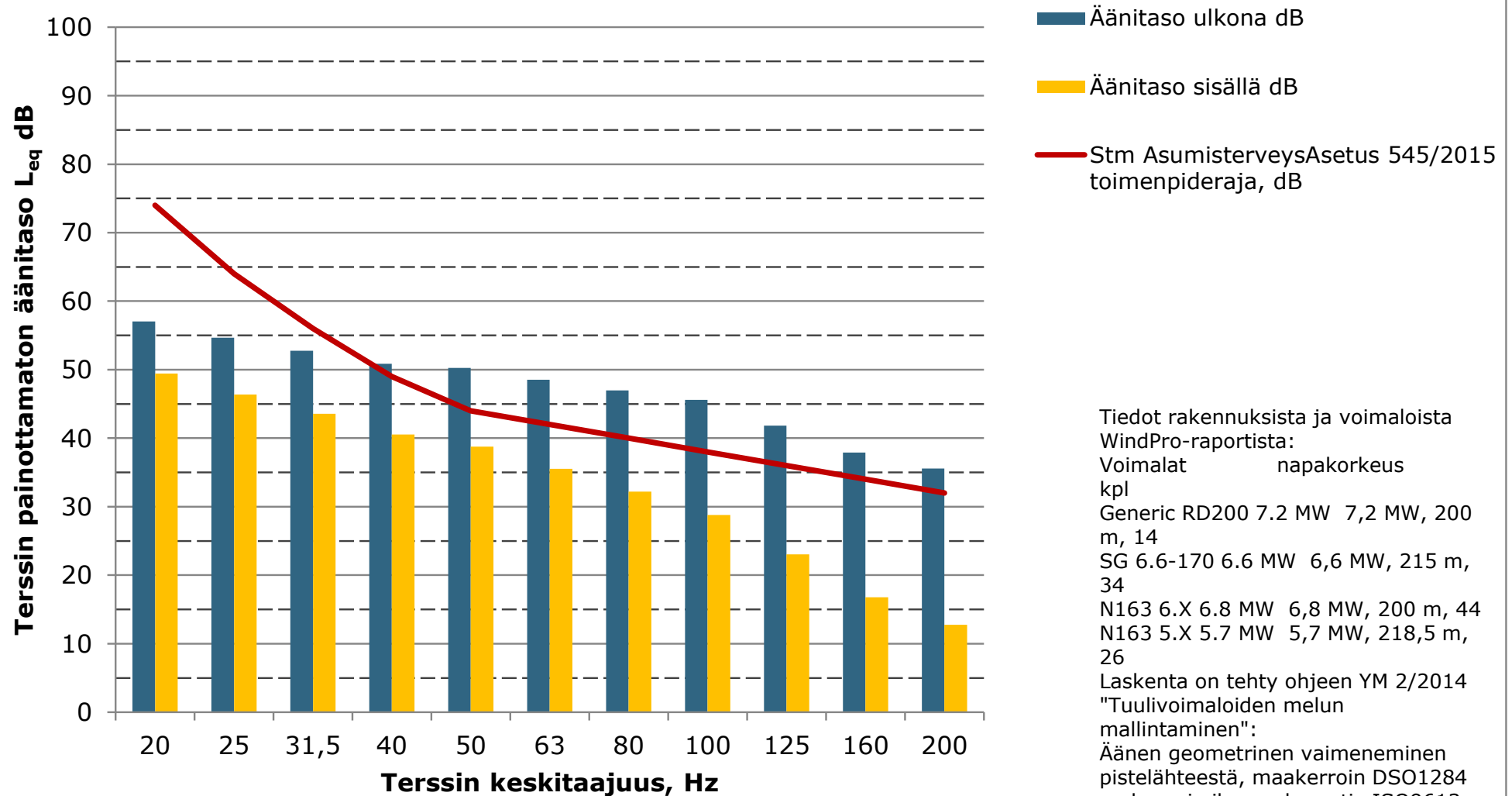


**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus R
(Korpelanperä), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**





**Matalien taajuuksien äänitasot ulkona ja sisällä, Lomarakennus T
(Kärsämäenneva), ääneneristävyys Keränen,Hakala,Hongisto 2019, 84%
persentiili mukaan**



6.5.2024

Liite 16. Yhteisvaikutus varjostusmallinnuksen tulokset "real case, no forest" – Hankevaihtoehto 1 (VE1).

SHADOW - Main Result

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest

Assumptions for shadow calculations

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,46	4,19	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational hours are calculated from WTGs in calculation and wind distribution:

MERRA_N64,00_E026,002 (7)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
534	407	418	444	537	869	1 042	1 023	923	826	708	685	8 415

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE_Pyhäntä_Pilpankangas

Receptor grid resolution: 1,0 m

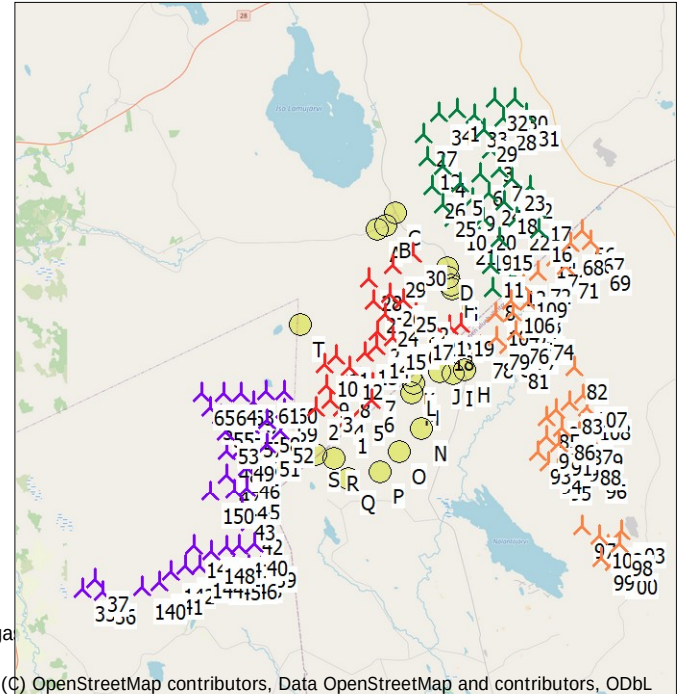
All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance	RPM
											[m]	[RPM]
1	465 686	7 082 467	165,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
1	471 839	7 098 977	152,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
2	464 106	7 083 255	147,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
2	475 592	7 094 825	177,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
3	464 951	7 083 636	154,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
3	473 530	7 096 766	168,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
4	470 952	7 095 933	163,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
4	465 561	7 083 192	163,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
5	466 536	7 083 117	165,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
5	471 895	7 094 973	170,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
6	467 111	7 083 592	159,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
6	472 999	7 095 500	175,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
7	474 026	7 095 796	179,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
7	467 136	7 084 492	159,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
8	473 642	7 089 459	165,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
8	465 786	7 084 367	164,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
9	472 556	7 094 191	172,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
9	464 736	7 084 392	152,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
10	471 545	7 093 189	175,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
10	464 636	7 085 517	155,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
11	465 236	7 085 992	159,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
11	473 523	7 090 697	166,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
12	465 936	7 085 367	160,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
12	474 724	7 090 192	163,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
13	470 207	7 096 391	155,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
13	466 761	7 086 117	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
14	476 298	7 091 642	169,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
14	467 386	7 086 467	159,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
15	468 261	7 086 867	156,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
15	473 955	7 092 082	169,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
16	476 097	7 092 538	175,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
16	468 936	7 087 192	156,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4

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Scale 1:400 000

New WTG

Shadow receptor

SHADOW - Main Result

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest

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	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM [RPM]
			[m]									
17	475 979	7 093 646	177,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
17	469 711	7 087 392	157,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
18	474 232	7 094 014	173,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
18	470 821	7 086 831	160,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
19	471 948	7 087 636	182,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
19	472 921	7 092 121	171,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
20	471 311	7 087 492	168,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
20	473 133	7 093 196	170,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
21	470 411	7 087 617	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
21	472 045	7 092 434	174,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
22	474 928	7 093 153	170,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
22	469 511	7 088 317	160,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
23	467 436	7 087 242	169,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
23	474 653	7 095 212	177,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
24	473 450	7 094 501	175,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
24	467 861	7 088 142	165,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
25	470 952	7 093 929	178,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
25	468 861	7 088 892	163,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
26	468 133	7 089 218	165,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
26	470 430	7 094 892	173,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
27	467 261	7 088 867	167,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
27	469 994	7 097 616	152,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
28	474 257	7 098 465	167,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
28	466 998	7 090 015	168,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
29	468 282	7 090 703	164,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
29	473 217	7 097 856	165,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
30	469 365	7 091 361	164,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
30	474 833	7 099 446	158,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
31	475 413	7 098 667	166,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
32	473 764	7 099 462	155,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
33	472 690	7 098 642	163,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
34	470 814	7 098 750	149,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
35	451 581	7 073 772	158,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
36	452 643	7 073 538	167,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
37	452 257	7 074 208	165,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
38	460 464	7 074 829	160,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
39	461 281	7 075 412	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
40	460 757	7 075 976	167,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
41	459 969	7 075 947	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
42	460 546	7 077 169	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
43	460 145	7 077 917	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
44	459 750	7 078 896	159,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
45	460 442	7 078 943	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
46	460 444	7 080 110	153,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
47	459 354	7 079 749	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
48	459 388	7 081 028	159,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
49	460 134	7 081 058	153,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
50	460 841	7 081 305	154,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
51	461 555	7 081 300	161,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
52	462 188	7 082 027	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
53	459 303	7 081 995	159,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
54	458 512	7 083 293	159,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
55	459 029	7 082 918	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
56	460 005	7 082 543	155,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
57	460 674	7 082 318	170,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
58	461 562	7 082 598	157,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
59	462 456	7 083 133	142,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
60	462 420	7 084 164	147,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
61	461 480	7 084 123	147,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
62	460 791	7 083 521	156,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
63	460 145	7 084 063	157,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
64	459 285	7 084 065	159,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
65	458 038	7 084 037	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
66	478 336	7 092 455	177,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4

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SHADOW - Main Result

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest

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	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM [RPM]
			[m]									
67	478 845	7 091 899	190,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
68	477 742	7 091 824	177,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
69	479 177	7 090 979	185,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
70	476 955	7 091 051	172,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
71	477 487	7 090 620	182,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
72	475 964	7 090 352	164,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
73	475 501	7 088 705	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
74	476 189	7 087 343	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
75	475 611	7 087 510	161,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
76	474 845	7 087 199	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
77	475 310	7 086 848	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
78	472 937	7 086 386	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
79	473 780	7 086 830	165,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
80	474 399	7 086 459	160,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
81	474 825	7 085 835	158,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
82	477 918	7 085 282	163,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
83	477 610	7 083 418	159,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
84	476 957	7 082 967	158,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
85	476 370	7 082 967	156,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
86	477 187	7 082 052	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
87	478 121	7 081 764	160,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
88	478 641	7 080 668	158,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
89	478 709	7 081 538	163,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
90	477 972	7 080 917	155,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
91	477 084	7 081 229	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
92	476 355	7 081 601	162,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
93	475 903	7 080 778	161,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
94	476 526	7 080 222	157,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
95	476 972	7 079 815	154,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
96	478 868	7 079 944	156,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
97	478 217	7 076 798	138,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
98	480 292	7 075 796	153,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
99	479 248	7 075 045	139,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
100	479 889	7 074 867	140,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
101	479 686	7 075 714	147,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
102	479 198	7 076 190	147,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
103	480 317	7 076 500	159,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
104	473 769	7 088 131	166,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
105	474 672	7 088 183	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
106	474 559	7 088 784	163,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
107	478 369	7 083 786	163,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
108	478 581	7 083 109	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
109	475 224	7 089 562	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
140	454 719	7 073 768	173,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
141	455 680	7 074 064	172,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
142	456 302	7 074 586	168,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
143	457 041	7 074 897	162,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
144	457 886	7 074 902	159,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
145	458 721	7 074 755	155,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
146	459 613	7 074 759	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
147	459 300	7 075 859	159,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
148	458 492	7 075 619	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
149	457 550	7 075 973	161,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
150	458 434	7 078 806	167,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
							a.g.l.	window		(ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (Nurmiaho)	467 539	7 092 595	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Kivikangas)	467 993	7 092 829	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0

To be continued on next page...

SHADOW - Main Result

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest

...continued from previous page

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l.	window		(ZVI) a.g.l.
							[m]	[°]		[m]
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakenus G (Pääkkölä)	471 494	7 089 419	197,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Nuuttila)	471 499	7 084 904	165,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomarakenus J (Ahmokangas)	470 723	7 085 089	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Lomarakenus P (Kuistila)	467 531	7 079 776	162,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Lomarakenus R (Korpelanperä)	465 124	7 080 510	140,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Lomarakenus T (Kärsämäenneva)	463 349	7 087 611	152,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours
		per year
		[h/year]
A	Asuinrakennus A (Nurmiaho)	2:43
B	Asuinrakennus B (Kivikangas)	3:03
C	Asuinrakennus C (Koukkula)	0:00
D	Asuinrakennus D (Konola)	2:40
E	Asuinrakennus E (Piippo)	0:00
F	Asuinrakennus F (Pääkkö)	3:31
G	Lomarakenus G (Pääkkölä)	4:22
H	Asuinrakennus H (Peltola)	0:45
I	Asuinrakennus I (Nuuttila)	5:08
J	Lomarakenus J (Ahmokangas)	0:00
K	Asuinrakennus K (Ketola)	1:41
L	Asuinrakennus L (Tuohipuro)	0:00
M	Asuinrakennus M (Pilpanperä)	3:50
N	Asuinrakennus N (Hanhikaarto)	0:00
O	Asuinrakennus O (Ketola)	0:00
P	Lomarakenus P (Kuistila)	0:00
Q	Asuinrakennus Q (Hautalehto)	0:00
R	Lomarakenus R (Korpelanperä)	0:00
S	Asuinrakennus S (Myllymäki)	0:00
T	Lomarakenus T (Kärsämäenneva)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected
		[h/year]
1	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (874)	0:00
1	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (450)	0:00
2	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (872)	0:00
2	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (451)	0:00
3	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (887)	0:00
3	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (452)	0:00
4	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (453)	0:00
4	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (890)	0:00
5	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (881)	0:00
5	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (454)	0:00
6	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (870)	1:34
6	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (455)	0:00
7	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (456)	0:00
7	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (884)	3:58
8	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (457)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest

...continued from previous page

No.	Name	Expected [h/year]
8	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (869)	0:00
9	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (458)	0:00
9	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (885)	0:00
10	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (459)	0:00
10	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (879)	0:00
11	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (894)	0:00
11	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (460)	0:00
12	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (891)	0:00
12	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (461)	0:00
13	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (462)	0:00
13	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (893)	0:00
14	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (463)	0:00
14	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (886)	0:00
15	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (888)	0:00
15	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (464)	0:00
16	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (465)	0:00
16	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (871)	0:00
17	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (466)	0:00
17	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (880)	0:00
18	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (467)	0:00
18	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (877)	0:45
19	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (873)	2:05
19	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (468)	0:00
20	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (882)	2:27
20	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (469)	0:00
21	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (898)	1:52
21	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (470)	0:00
22	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (471)	0:00
22	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (892)	0:00
23	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (878)	0:00
23	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (472)	0:00
24	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (473)	0:00
24	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (895)	0:00
25	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (474)	0:00
25	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (875)	0:00
26	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (889)	0:00
26	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (475)	0:00
27	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (883)	0:00
27	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (476)	0:00
28	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (477)	0:00
28	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (897)	0:00
29	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (876)	2:49
29	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (478)	0:00
30	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (896)	5:36
30	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (479)	0:00
31	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (480)	0:00
32	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (481)	0:00
33	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (482)	0:00
34	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (483)	0:00
35	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (659)	0:00
36	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (660)	0:00
37	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (661)	0:00
38	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (662)	0:00
39	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (663)	0:00
40	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (664)	0:00
41	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (665)	0:00
42	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (666)	0:00
43	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (667)	0:00
44	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (668)	0:00
45	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (669)	0:00
46	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (670)	0:00
47	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (671)	0:00
48	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (672)	0:00
49	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (673)	0:00
50	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (674)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest

...continued from previous page

No.	Name	Expected [h/year]
51	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (675)	0:00
52	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (676)	0:00
53	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (677)	0:00
54	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (678)	0:00
55	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (679)	0:00
56	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (680)	0:00
57	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (681)	0:00
58	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (682)	0:00
59	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (683)	0:00
60	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (684)	0:00
61	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (685)	0:00
62	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (686)	0:00
63	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (687)	0:00
64	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (688)	0:00
65	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (689)	0:00
66	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (795)	0:00
67	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (796)	0:00
68	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (797)	0:00
69	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (798)	0:00
70	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (799)	0:00
71	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (800)	0:00
72	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (801)	0:00
73	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (802)	0:00
74	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (803)	0:00
75	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (804)	0:00
76	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (805)	0:00
77	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (806)	0:00
78	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (807)	5:08
79	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (808)	0:00
80	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (809)	0:00
81	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (810)	0:00
82	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (811)	0:00
83	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (812)	0:00
84	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (813)	0:00
85	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (814)	0:00
86	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (815)	0:00
87	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (816)	0:00
88	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (817)	0:00
89	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (818)	0:00
90	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (819)	0:00
91	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (820)	0:00
92	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (821)	0:00
93	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (822)	0:00
94	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (823)	0:00
95	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (824)	0:00
96	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (825)	0:00
97	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (826)	0:00
98	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (827)	0:00
99	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (828)	0:00
100	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (829)	0:00
101	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (830)	0:00
102	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (831)	0:00
103	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (832)	0:00
104	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (833)	0:00
105	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (834)	0:00
106	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (835)	0:00
107	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (836)	0:00
108	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (837)	0:00
109	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (838)	0:00
140	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (899)	0:00
141	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (900)	0:00
142	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (901)	0:00
143	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (902)	0:00
144	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (903)	0:00
145	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (904)	0:00

To be continued on next page...

Project:

Pyhäntä_Pilpankangas

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Calculated:
2.5.2024 18.01/3.6.377

SHADOW - Main Result

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest

...continued from previous page

No.	Name	Expected [h/year]
146	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (905)	0:00
147	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (906)	0:00
148	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (907)	0:00
149	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (908)	0:00
150	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (909)	0:00

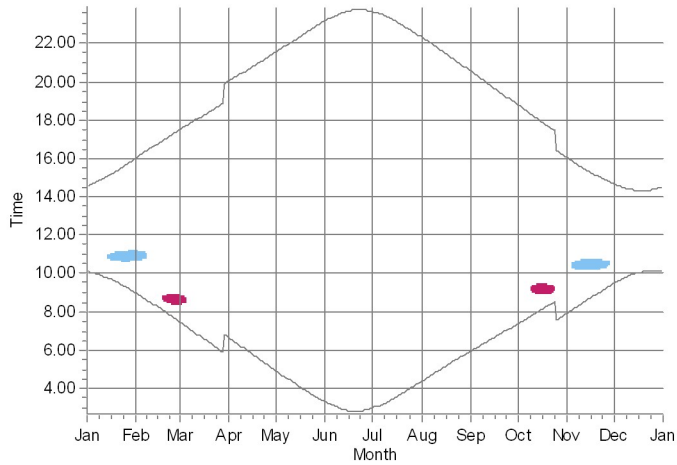
Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

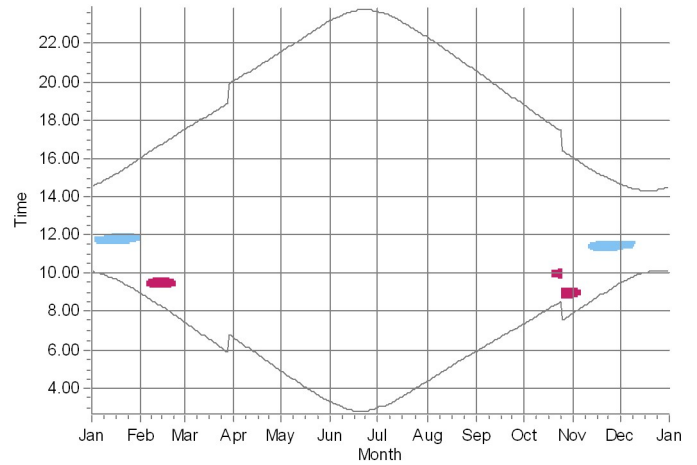
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest

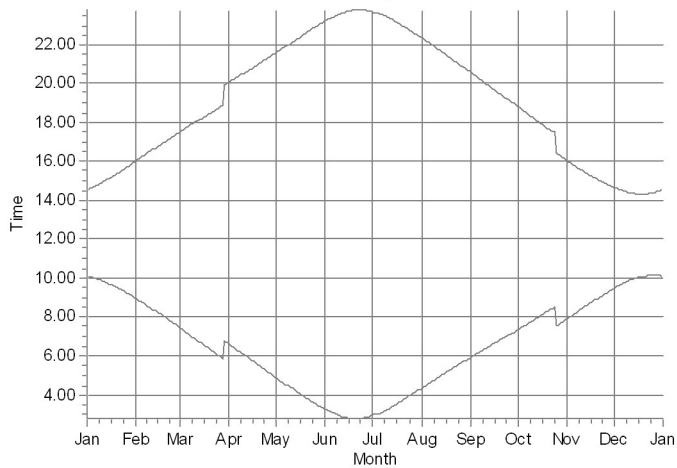
A: Asuinrakennus A (Nurmiaho)



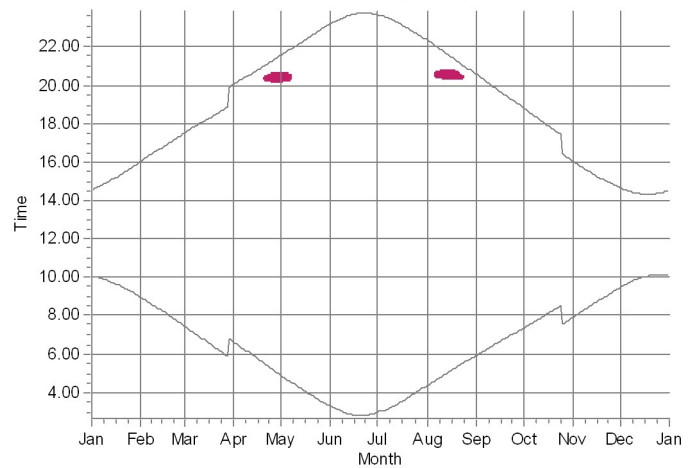
B: Asuinrakennus B (Kivikangas)



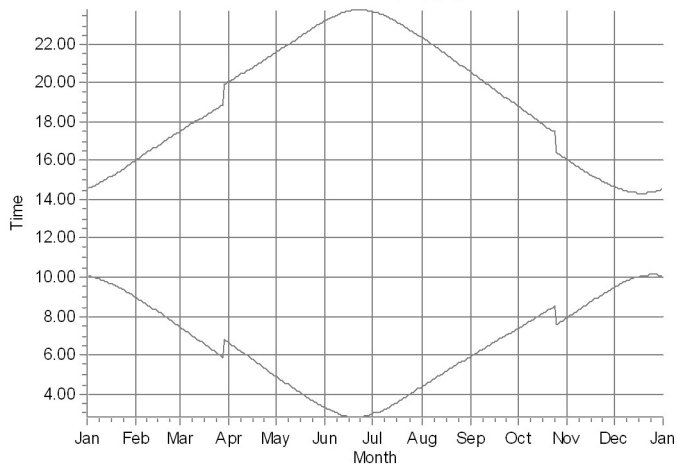
C: Asuinrakennus C (Koukkula)



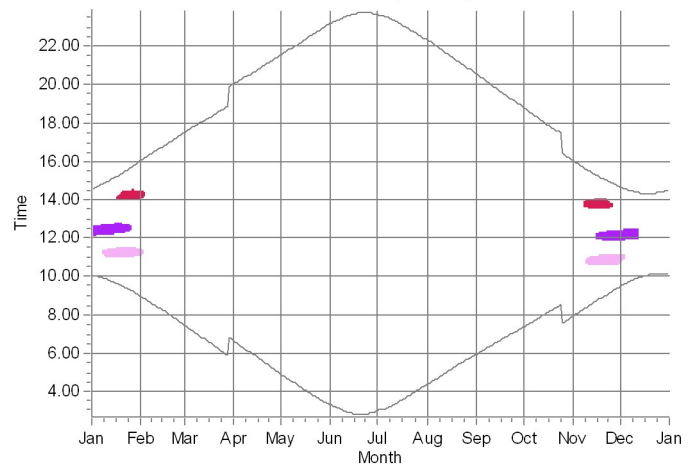
D: Asuinrakennus D (Konola)



E: Asuinrakennus E (Piippo)



F: Asuinrakennus F (Pääkkö)



12.00 - 14.00: General 922200 922200 7200 200.0 101 200.0 m (7207 200.0 m) (8716)

12.00 - 14.00: General 922200 922200 7200 200.0 101 200.0 m (7207 200.0 m) (8716)

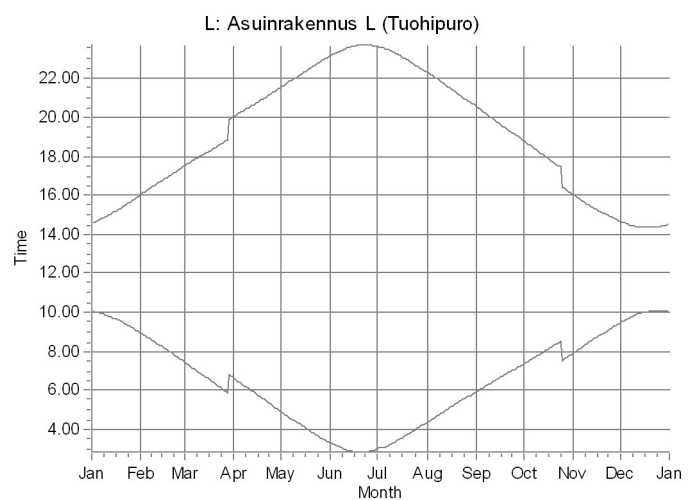
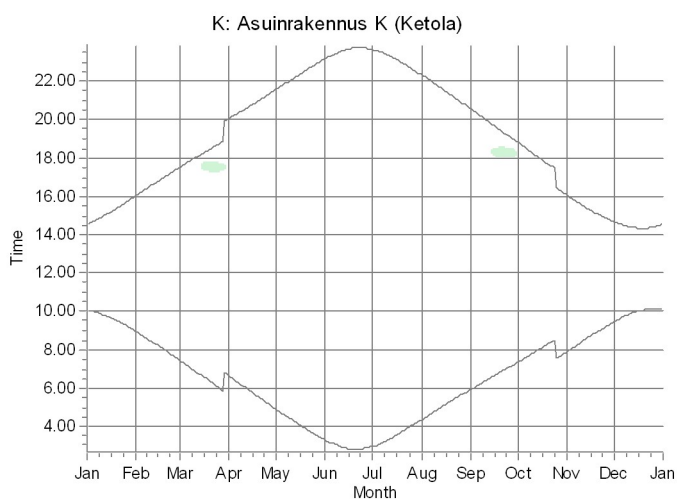
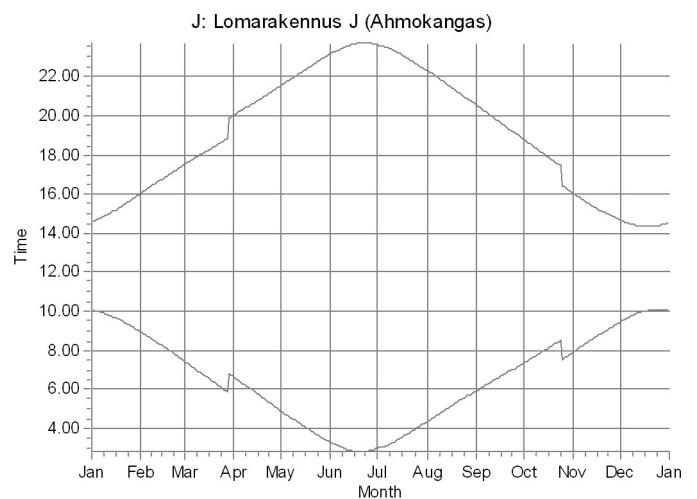
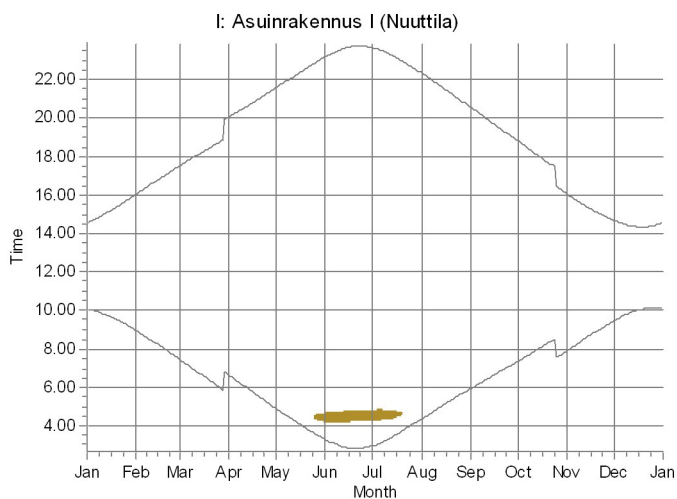
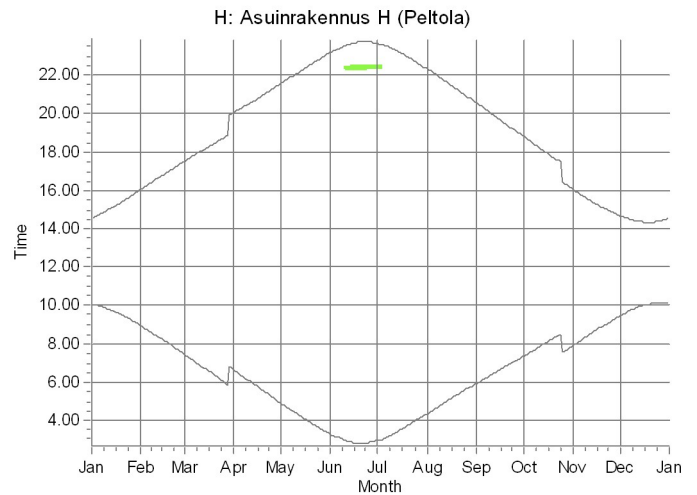
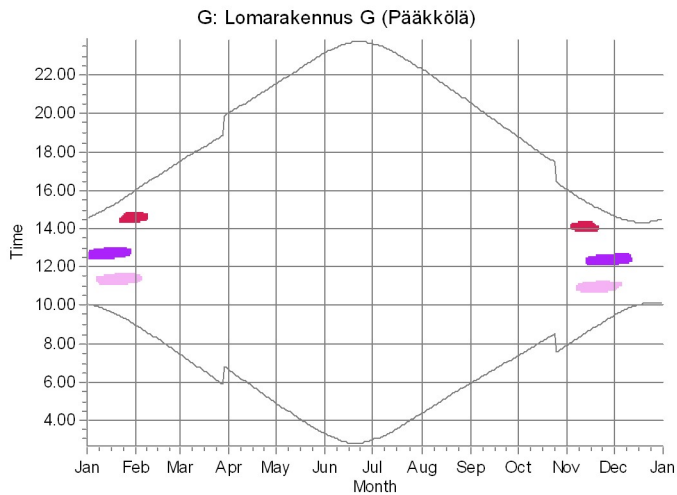
12.00 - 14.00: General 922200 922200 7200 200.0 101 200.0 m (7207 200.0 m) (8823)

12.00 - 14.00: General 922200 922200 7200 200.0 101 200.0 m (7207 200.0 m) (8844)

12.00 - 14.00: General 922200 922200 7200 200.0 101 200.0 m (7207 200.0 m) (8844)

SHADOW - Calendar, graphical

Calculation: Pilpangkang VE1_20240410_Yhteisvaikutus_No forest



WTGs

79: Generic: RD2000 H42000 99W4.75 6890 250.0 10° hub: 200.0 m (TOT: 300.0 m) (807)	18: Generic: RD2000 H42000 7200 250.0 10° hub: 200.0 m (TOT: 300.0 m) (807)	7: Generic: RD2000 H42000 7200 250.0 10° hub: 200.0 m (TOT: 300.0 m) (884)
19: Generic: RD2000 H42000 7090 250.0 10° hub: 200.0 m (TOT: 300.0 m) (872)	20: Generic: RD2000 H42000 7200 250.0 10° hub: 200.0 m (TOT: 300.0 m) (882)	21: Generic: RD2000 H42000 7090 250.0 10° hub: 200.0 m (TOT: 300.0 m) (886)

Project:

Pyhäntä_Pilpankangas

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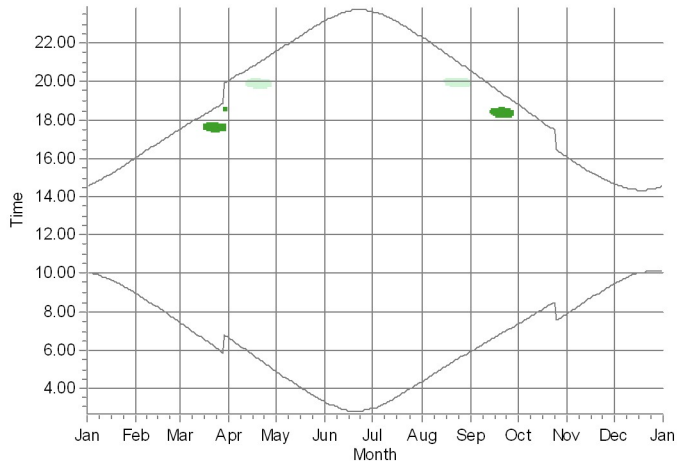
Calculated:

2.5.2024 18.01/3.6.377

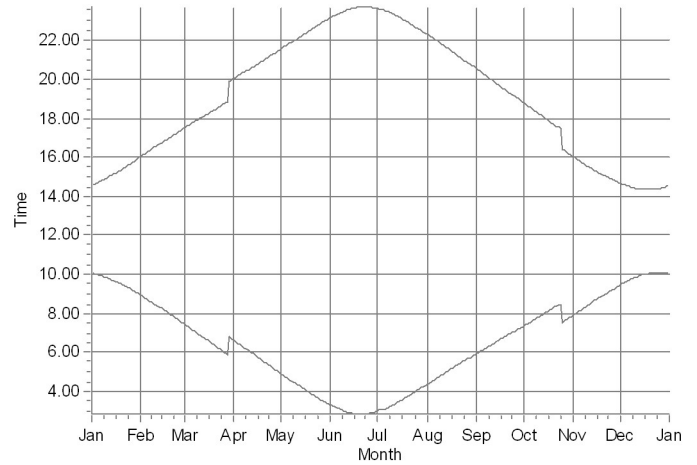
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest

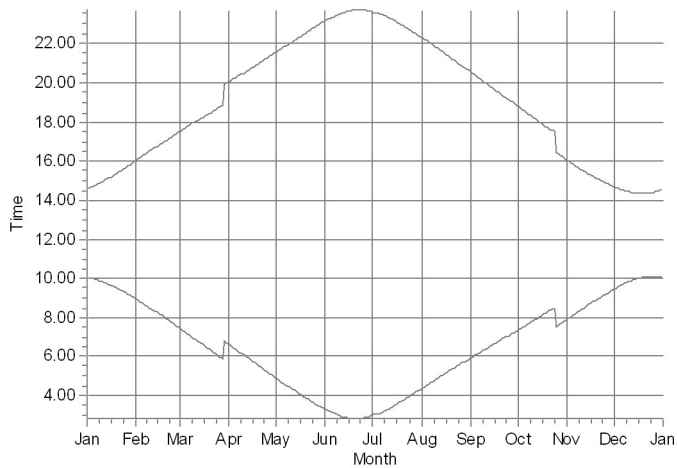
M: Asuinrakennus M (Pilpanperä)



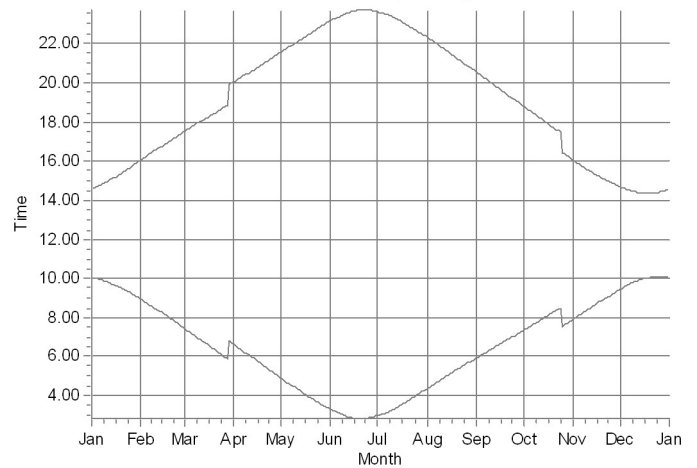
N: Asuinrakennus N (Hanhikaarto)



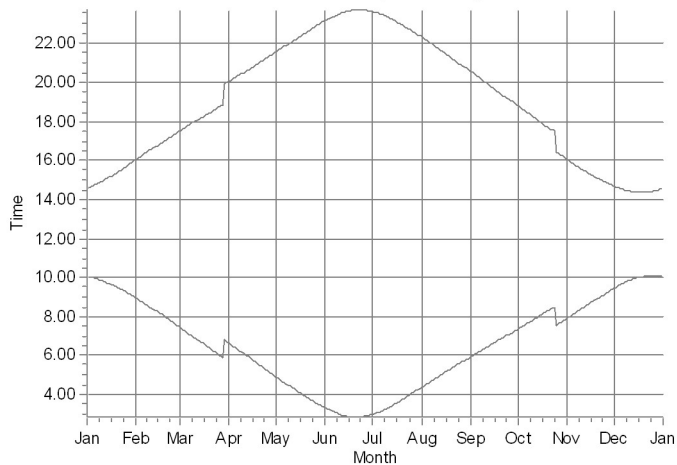
O: Asuinrakennus O (Ketola)



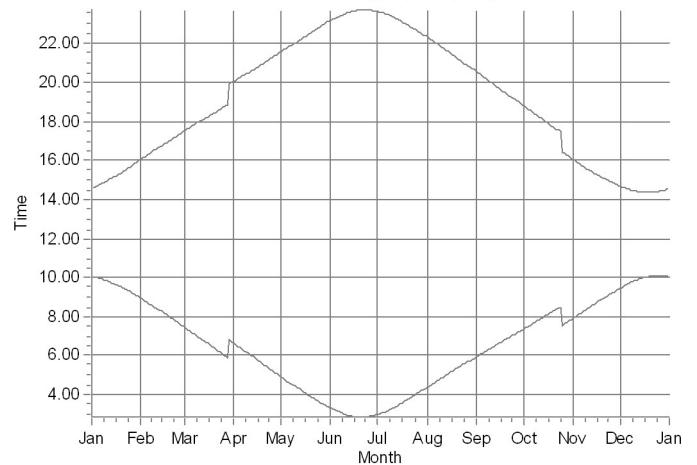
P: Lomarakennus P (Kuistila)



Q: Asuinrakennus Q (Hautalehto)



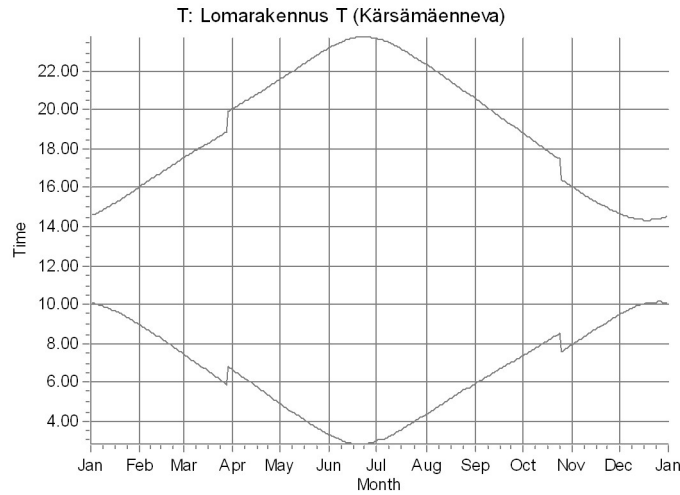
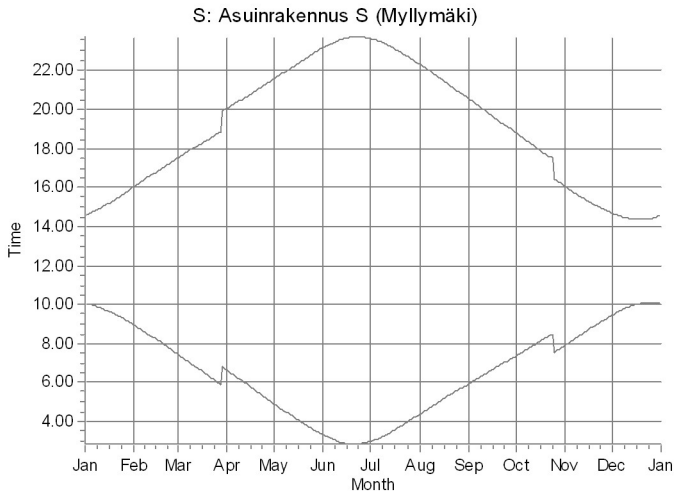
R: Lomarakennus R (Korpelanperä)



WTC: 0: Gemin 92200 44200 7200 200.0 101 Ndb: 200.0 101 (707: 200.0 101) (870) 7: Gemin 92200 44200 7200 200.0 101 Ndb: 200.0 101 (707: 200.0 101) (880)

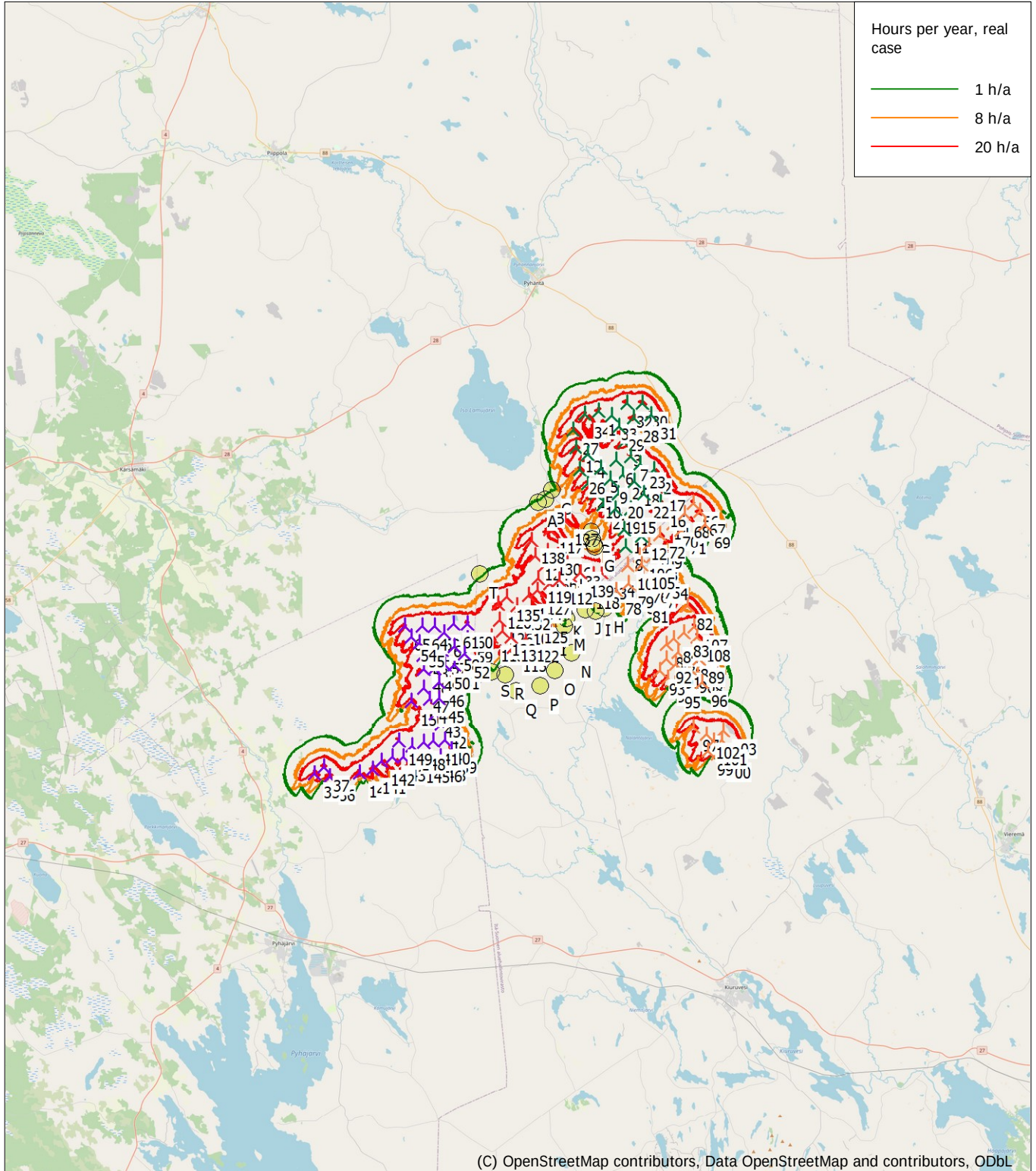
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest



SHADOW - Map

Calculation: Pilpankangas VE1_20240410_Yhteisvaikutus_No forest



Map: EMD OpenStreetMap , Print scale 1:400 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 466 780 North: 7 087 120
New WTG Shadow receptor
Flicker map level: Height Contours: CONTOURLINE_Pyhäntä_Pilpankangas_0.wpo (1)
Time step: 3 minutes, Day step: 7 days, Map resolution: 20 m, Visibility resolution: 10 m, Eye height: 1,5 m

6.5.2024

Liite 17. Yhteisvaikutus varjostusmallinnuksen tulokset "real case, no forest" – Hankevaihtoehto 2 (VE2).

Project:

Pyhäntä_Pilpankangas

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Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

3.5.2024 10.14/3.6.377

SHADOW - Main Result

Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest

Assumptions for shadow calculations

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,46	4,19	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational hours are calculated from WTGs in calculation and wind distribution:

MERRA_N64,00_E026,002 (7)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
534	407	418	444	537	869	1 042	1 023	923	826	708	685	8 415

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE_Pyhäntä_Pilpankangas

Receptor grid resolution: 1,0 m

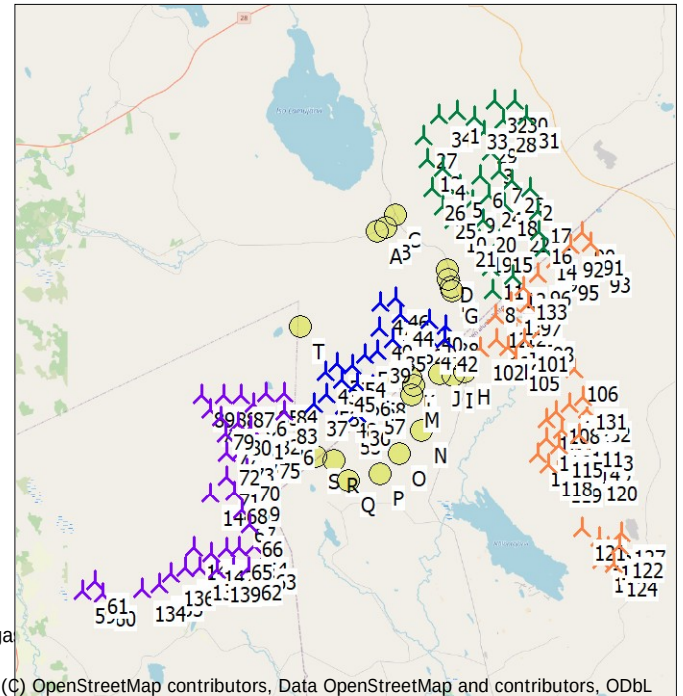
All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.	Type-generator				Calculation distance [m]	RPM [RPM]
1	471 839	7 098 977	152,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
2	475 592	7 094 825	177,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
3	473 530	7 096 766	168,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
4	470 952	7 095 933	163,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
5	471 895	7 094 973	170,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
6	472 999	7 095 500	175,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
7	474 026	7 095 796	179,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
8	473 642	7 089 459	165,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
9	472 556	7 094 191	172,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
10	471 545	7 093 189	175,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
11	473 523	7 090 697	166,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
12	474 724	7 090 192	163,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
13	470 207	7 096 391	155,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
14	476 298	7 091 642	169,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
15	473 955	7 092 082	169,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
16	476 097	7 092 538	175,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
17	475 979	7 093 646	177,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
18	474 232	7 094 014	173,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
19	472 921	7 092 121	171,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
20	473 133	7 093 196	170,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
21	472 045	7 092 434	174,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
22	474 928	7 093 153	170,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
23	474 653	7 095 212	177,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
24	473 450	7 094 501	175,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
25	470 952	7 093 929	178,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
26	470 430	7 094 892	173,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
27	469 994	7 097 616	152,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
28	474 257	7 098 465	167,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
29	473 217	7 097 856	165,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
30	474 833	7 099 446	158,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
31	475 413	7 098 667	166,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
32	473 764	7 099 462	155,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4

To be continued on next page...



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

Scale 1:400 000

New WTG

Shadow receptor

SHADOW - Main Result

Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM [RPM]
			[m]									
33	472 690	7 098 642	163,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
34	470 814	7 098 750	149,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
35	468 261	7 086 867	156,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
36	466 361	7 082 992	166,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
37	464 036	7 083 492	147,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
38	471 111	7 087 617	166,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
39	467 461	7 086 317	159,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
40	470 261	7 087 917	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
41	470 186	7 087 042	157,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
42	471 011	7 086 842	163,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
43	464 686	7 085 217	154,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
44	468 686	7 088 267	159,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
45	465 536	7 084 792	162,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
46	468 449	7 089 139	165,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
47	467 636	7 088 842	165,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
48	465 586	7 083 442	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
49	467 511	7 087 492	165,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
50	466 761	7 086 117	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
51	465 286	7 085 667	158,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
52	469 186	7 087 292	156,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
53	464 736	7 084 017	151,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
54	466 111	7 085 542	160,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
55	465 786	7 082 517	166,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
56	466 336	7 084 592	161,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
57	467 111	7 083 592	159,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
58	467 136	7 084 492	159,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
59	451 581	7 073 772	158,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
60	452 643	7 073 538	167,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
61	452 257	7 074 208	165,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
62	460 464	7 074 829	160,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
63	461 281	7 075 412	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
64	460 757	7 075 976	167,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
65	459 969	7 075 947	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
66	460 546	7 077 169	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
67	460 145	7 077 917	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
68	459 750	7 078 896	159,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
69	460 442	7 078 943	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
70	460 444	7 080 110	153,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
71	459 354	7 079 749	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
72	459 388	7 081 028	159,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
73	460 134	7 081 058	153,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
74	460 841	7 081 305	154,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
75	461 555	7 081 300	161,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
76	462 188	7 082 027	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
77	459 303	7 081 995	159,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
78	458 512	7 083 293	159,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
79	459 029	7 082 918	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
80	460 005	7 082 543	155,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
81	460 674	7 082 318	170,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
82	461 562	7 082 598	157,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
83	462 456	7 083 133	142,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
84	462 420	7 084 164	147,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
85	461 480	7 084 123	147,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
86	460 791	7 083 521	156,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
87	460 145	7 084 063	157,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
88	459 285	7 084 065	159,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
89	458 038	7 084 037	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
90	478 336	7 092 455	177,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
91	478 845	7 091 899	190,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
92	477 742	7 091 824	177,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
93	479 177	7 090 979	185,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
94	476 955	7 091 051	172,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
95	477 487	7 090 620	182,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
96	475 964	7 090 352	164,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4

To be continued on next page...

SHADOW - Main Result

Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM [RPM]
			[m]									
97	475 501	7 088 705	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
98	476 189	7 087 343	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
99	475 611	7 087 510	161,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
100	474 845	7 087 199	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
101	475 310	7 086 848	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
102	472 937	7 086 386	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
103	473 780	7 086 830	155,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
104	474 399	7 086 459	160,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
105	474 825	7 085 835	158,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
106	477 918	7 085 282	163,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
107	477 610	7 083 418	159,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
108	476 957	7 082 967	158,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
109	476 370	7 082 551	156,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
110	477 187	7 082 052	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
111	478 121	7 081 764	160,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
112	478 641	7 080 668	158,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
113	478 709	7 081 538	163,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
114	477 972	7 080 917	155,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
115	477 084	7 079 815	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
116	476 355	7 081 601	162,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
117	475 903	7 080 778	161,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
118	476 526	7 080 222	157,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
119	476 972	7 079 815	154,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
120	478 868	7 079 944	156,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
121	478 217	7 076 798	138,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
122	480 292	7 075 796	153,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
123	479 248	7 075 045	139,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
124	479 889	7 074 867	140,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
125	479 686	7 075 714	147,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
126	479 198	7 076 190	147,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
127	480 317	7 076 500	159,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
128	473 769	7 088 131	166,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
129	474 672	7 088 183	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
130	474 559	7 088 784	163,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
131	478 369	7 083 786	163,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
132	478 581	7 083 109	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
133	475 224	7 089 562	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
134	454 719	7 073 768	173,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
135	455 680	7 074 064	172,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
136	456 302	7 074 586	168,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
137	457 041	7 074 897	162,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
138	457 886	7 074 902	159,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
139	458 721	7 074 755	155,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
140	459 613	7 074 759	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
141	459 300	7 075 859	159,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
142	458 492	7 075 619	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
143	457 550	7 075 973	161,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
144	458 434	7 078 806	167,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
A	Asuinrakennus A (Nurmiaho)	467 539	7 092 595	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Kivikangas)	467 993	7 092 829	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Pääkkölä)	471 494	7 089 419	197,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Nuuttila)	471 499	7 084 904	165,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomarakennus J (Ahmokangas)	470 723	7 085 089	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0

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SHADOW - Main Result

Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest

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No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l.	window		(ZVI) a.g.l.
							[m]	[°]		[m]
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Lomarakennus P (Kuistila)	467 531	7 079 776	162,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Lomarakennus R (Korpelanperä)	465 124	7 080 510	140,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Lomarakennus T (Kärsämäenneva)	463 349	7 087 611	152,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours
		per year
		[h/year]
A	Asuinrakennus A (Nurmiaho)	0:00
B	Asuinrakennus B (Kivikangas)	0:00
C	Asuinrakennus C (Koukkula)	0:00
D	Asuinrakennus D (Konola)	0:00
E	Asuinrakennus E (Piippo)	0:00
F	Asuinrakennus F (Pääkkö)	2:36
G	Lomarakennus G (Pääkkölä)	3:04
H	Asuinrakennus H (Peltola)	0:00
I	Asuinrakennus I (Nuuttila)	5:08
J	Lomarakennus J (Ahmokangas)	0:00
K	Asuinrakennus K (Ketola)	1:41
L	Asuinrakennus L (Tuohipuro)	0:00
M	Asuinrakennus M (Pilpanperä)	3:50
N	Asuinrakennus N (Hanhikaarto)	0:00
O	Asuinrakennus O (Ketola)	0:00
P	Lomarakennus P (Kuistila)	0:00
Q	Asuinrakennus Q (Hautalehto)	0:00
R	Lomarakennus R (Korpelanperä)	0:00
S	Asuinrakennus S (Myllymäki)	0:00
T	Lomarakennus T (Kärsämäenneva)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected
		[h/year]
1	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (450)	0:00
2	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (451)	0:00
3	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (452)	0:00
4	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (453)	0:00
5	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (454)	0:00
6	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (455)	0:00
7	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (456)	0:00
8	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (457)	0:00
9	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (458)	0:00
10	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (459)	0:00
11	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (460)	0:00
12	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (461)	0:00
13	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (462)	0:00
14	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (463)	0:00
15	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (464)	0:00
16	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (465)	0:00
17	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (466)	0:00
18	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (467)	0:00
19	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (468)	0:00
20	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (469)	0:00
21	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (470)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest

...continued from previous page

No.	Name	Expected [h/year]
22	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (471)	0:00
23	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (472)	0:00
24	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (473)	0:00
25	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (474)	0:00
26	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (475)	0:00
27	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (476)	0:00
28	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (477)	0:00
29	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (478)	0:00
30	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (479)	0:00
31	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (480)	0:00
32	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (481)	0:00
33	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (482)	0:00
34	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (483)	0:00
35	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (552)	0:00
36	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (553)	0:00
37	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (554)	0:00
38	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (555)	2:41
39	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (556)	0:00
40	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (557)	2:34
41	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (558)	0:00
42	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (559)	0:00
43	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (560)	0:00
44	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (561)	0:00
45	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (562)	0:00
46	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (563)	0:00
47	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (564)	0:00
48	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (565)	0:00
49	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (566)	0:00
50	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (567)	0:00
51	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (568)	0:00
52	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (569)	0:00
53	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (570)	0:00
54	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (571)	0:00
55	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (572)	0:00
56	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (573)	0:00
57	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (574)	1:34
58	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (575)	3:58
59	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (659)	0:00
60	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (660)	0:00
61	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (661)	0:00
62	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (662)	0:00
63	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (663)	0:00
64	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (664)	0:00
65	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (665)	0:00
66	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (666)	0:00
67	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (667)	0:00
68	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (668)	0:00
69	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (669)	0:00
70	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (670)	0:00
71	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (671)	0:00
72	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (672)	0:00
73	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (673)	0:00
74	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (674)	0:00
75	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (675)	0:00
76	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (676)	0:00
77	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (677)	0:00
78	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (678)	0:00
79	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (679)	0:00
80	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (680)	0:00
81	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (681)	0:00
82	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (682)	0:00
83	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (683)	0:00
84	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (684)	0:00
85	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (685)	0:00
86	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (686)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest

...continued from previous page

No.	Name	Expected [h/year]
87	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (687)	0:00
88	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (688)	0:00
89	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (689)	0:00
90	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (795)	0:00
91	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (796)	0:00
92	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (797)	0:00
93	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (798)	0:00
94	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (799)	0:00
95	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (800)	0:00
96	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (801)	0:00
97	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (802)	0:00
98	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (803)	0:00
99	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (804)	0:00
100	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (805)	0:00
101	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (806)	0:00
102	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (807)	5:08
103	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (808)	0:00
104	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (809)	0:00
105	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (810)	0:00
106	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (811)	0:00
107	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (812)	0:00
108	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (813)	0:00
109	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (814)	0:00
110	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (815)	0:00
111	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (816)	0:00
112	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (817)	0:00
113	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (818)	0:00
114	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (819)	0:00
115	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (820)	0:00
116	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (821)	0:00
117	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (822)	0:00
118	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (823)	0:00
119	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (824)	0:00
120	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (825)	0:00
121	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (826)	0:00
122	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (827)	0:00
123	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (828)	0:00
124	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (829)	0:00
125	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (830)	0:00
126	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (831)	0:00
127	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (832)	0:00
128	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (833)	0:00
129	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (834)	0:00
130	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (835)	0:00
131	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (836)	0:00
132	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (837)	0:00
133	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (838)	0:00
134	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (899)	0:00
135	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (900)	0:00
136	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (901)	0:00
137	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (902)	0:00
138	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (903)	0:00
139	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (904)	0:00
140	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (905)	0:00
141	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (906)	0:00
142	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (907)	0:00
143	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (908)	0:00
144	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (909)	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

The calculation of the total expected values for a given receptor assumes a weighted average directional reduction for all WTGs contributing to shadow flicker within the same day. In the case where shadow flicker from different WTGs is not concurrent within the day, the total expected time at a given receptor may deviate marginally from the individual flicker time caused by each turbine separately.

Project:

Pyhäntä_Pilpankangas

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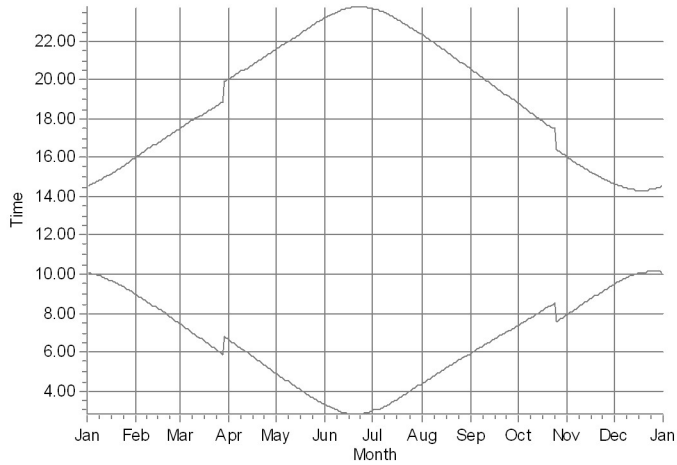
Calculated:

3.5.2024 10.14/3.6.377

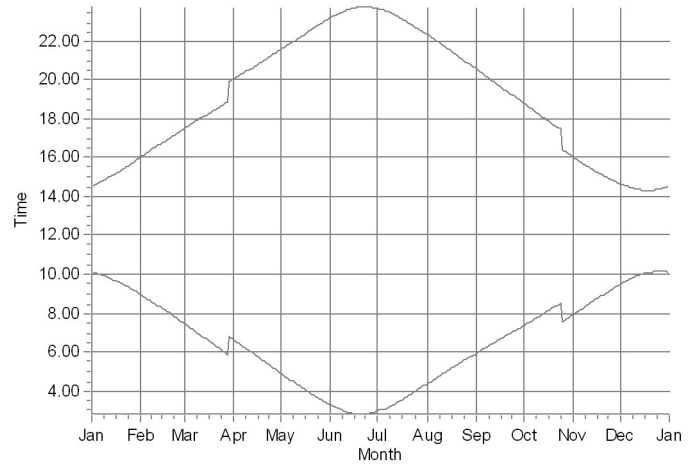
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest

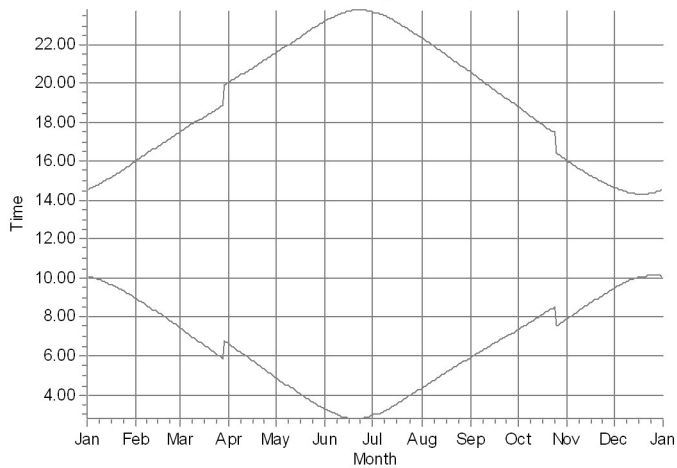
A: Asuinrakennus A (Nurmiaho)



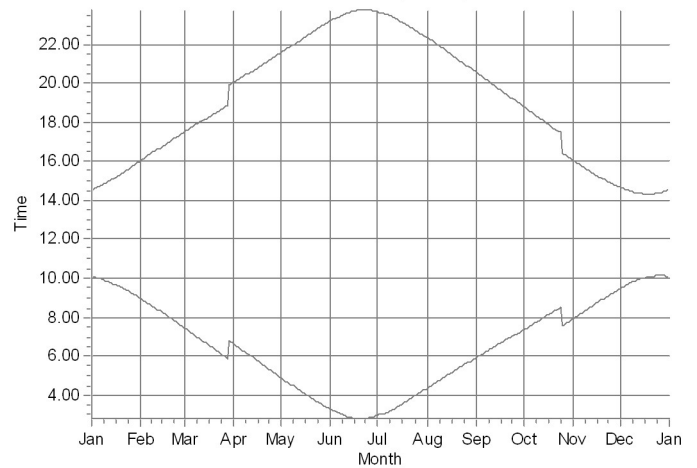
B: Asuinrakennus B (Kivikangas)



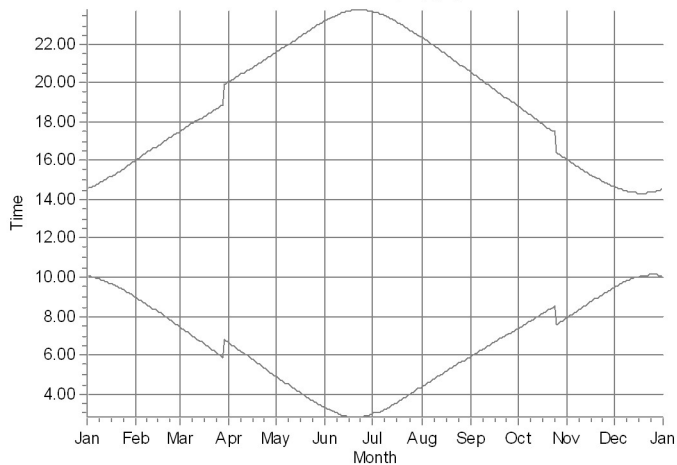
C: Asuinrakennus C (Koukkula)



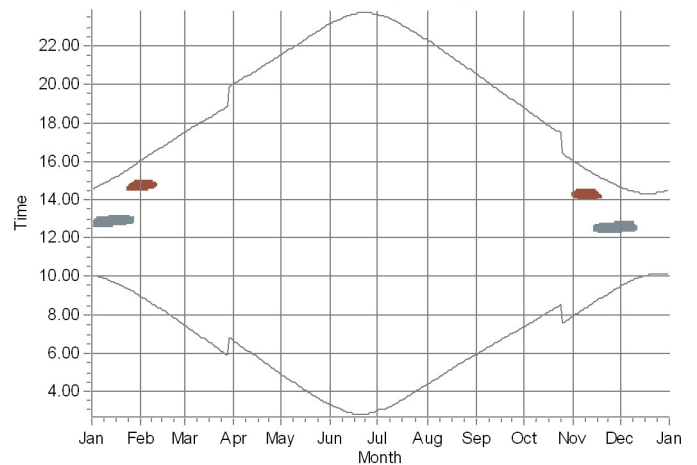
D: Asuinrakennus D (Konola)



E: Asuinrakennus E (Piippo)



F: Asuinrakennus F (Pääkkö)

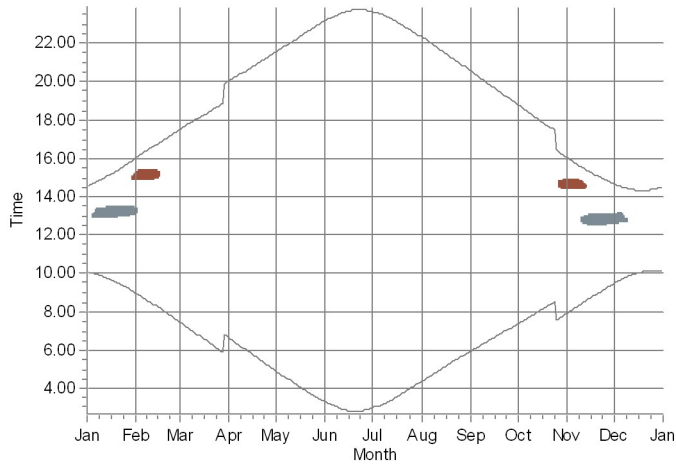


WTG: 30: Generac 80200 44200 7200 200.0 10: Hub: 200.0 m (707' 200.0 m) (200) 40: Generac 80200 44200 7200 200.0 10: Hub: 200.0 m (707' 200.0 m) (200)

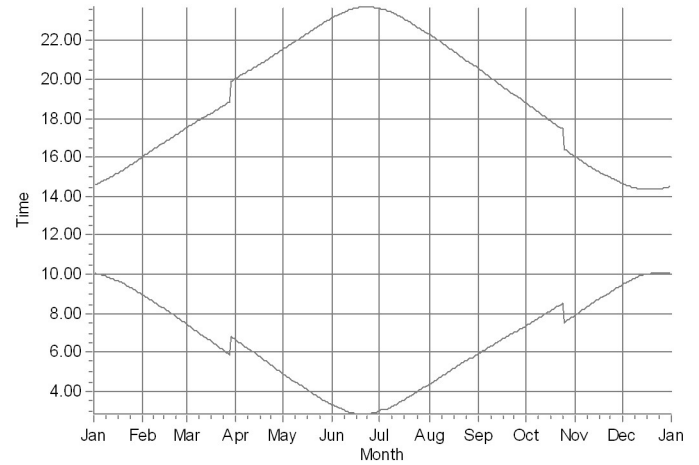
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest

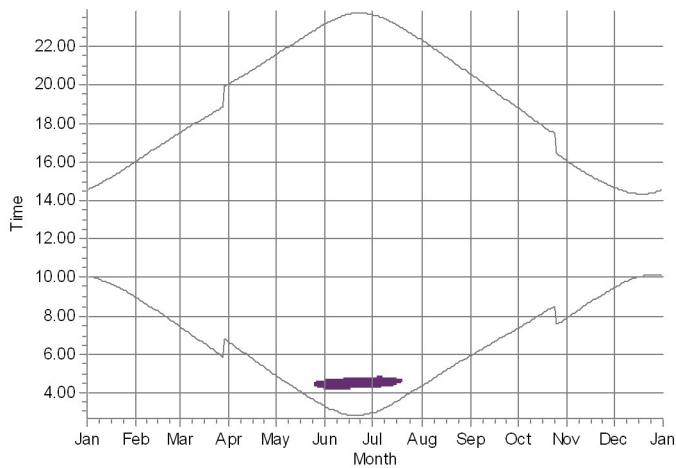
G: Lomarakennus G (Pääkkölä)



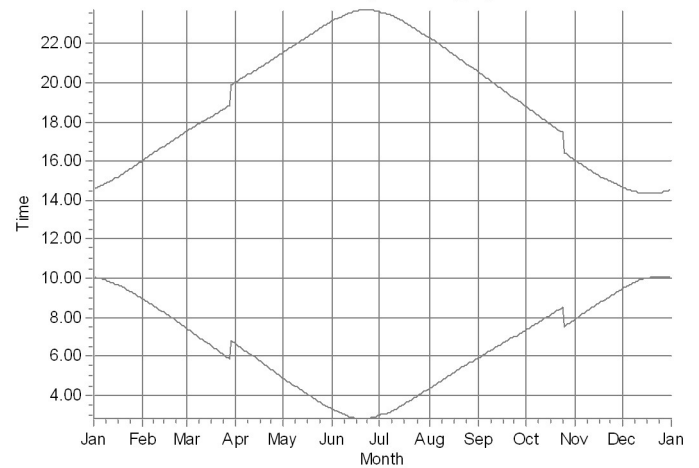
H: Asuinrakennus H (Peltola)



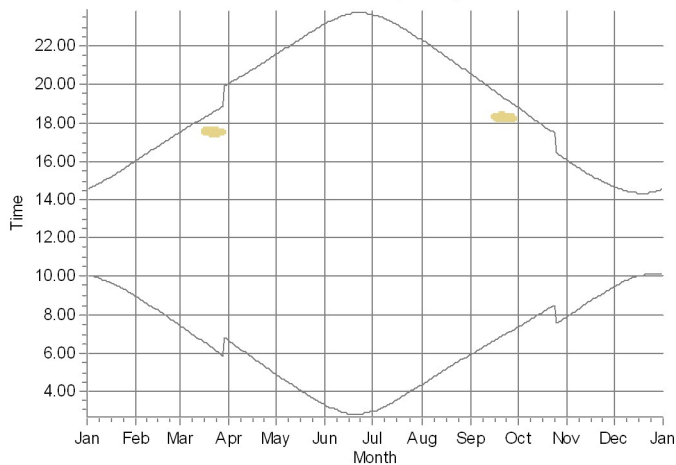
I: Asuinrakennus I (Nuuttila)



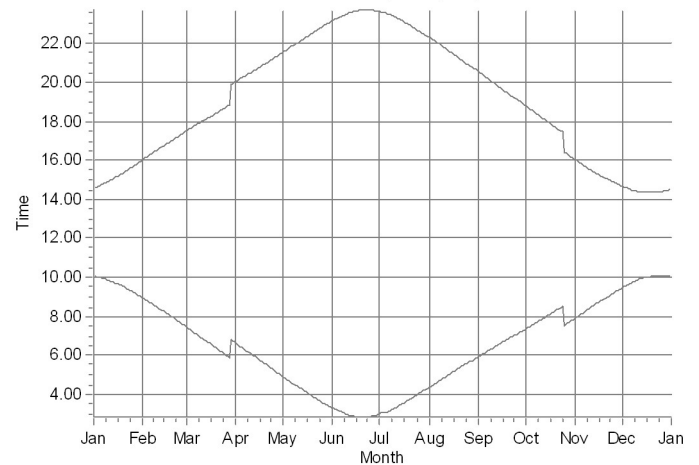
J: Lomarakennus J (Ahmokangas)



K: Asuinrakennus K (Ketola)



L: Asuinrakennus L (Tuohipuro)



WTCs

36: General: 82200: 44200: 7200: 260.0: 10: 260.0: 10: (717: 260.0: 10: (582))

40: General: 82200: 44200: 7200: 260.0: 10: 260.0: 10: (717: 260.0: 10: (582))

58: General: 82200: 44200: 7200: 260.0: 10: 260.0: 10: (717: 260.0: 10: (582))

102: General: 82200: 44200: 7200: 260.0: 10: 260.0: 10: (717: 260.0: 10: (582))

Project:

Pyhäntä_Pilpankangas

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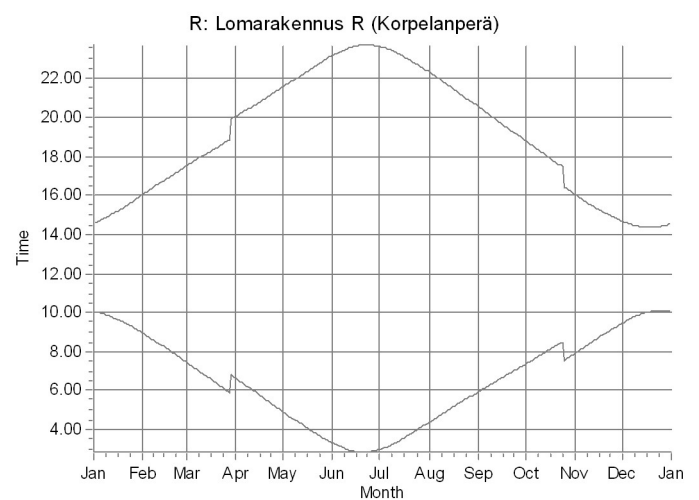
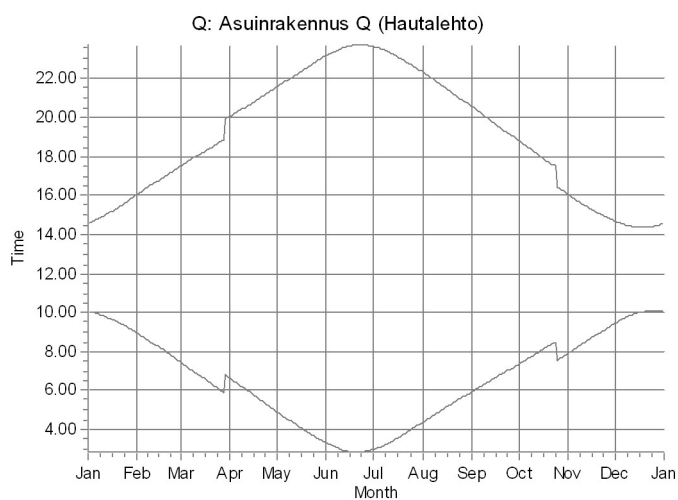
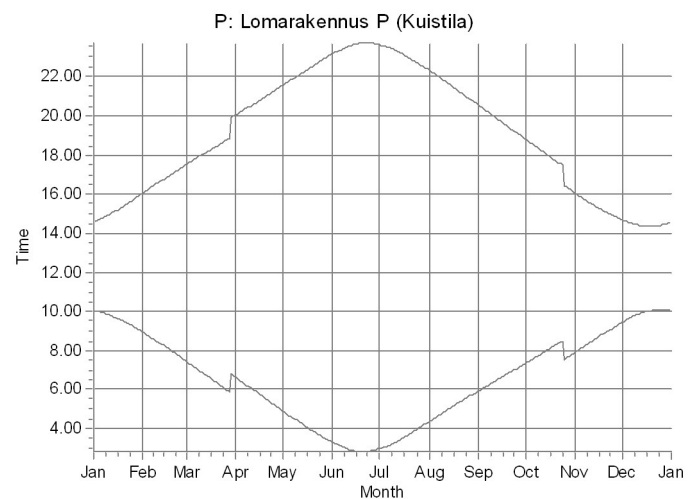
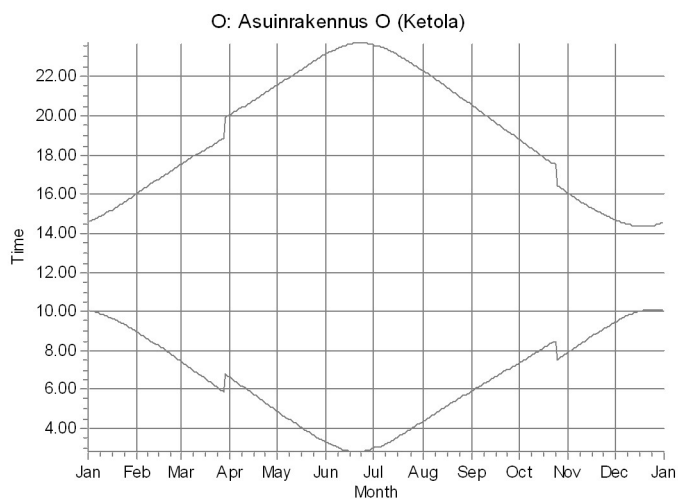
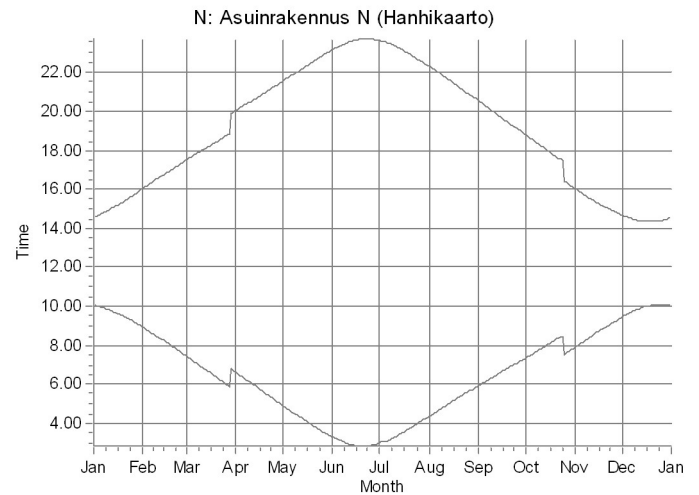
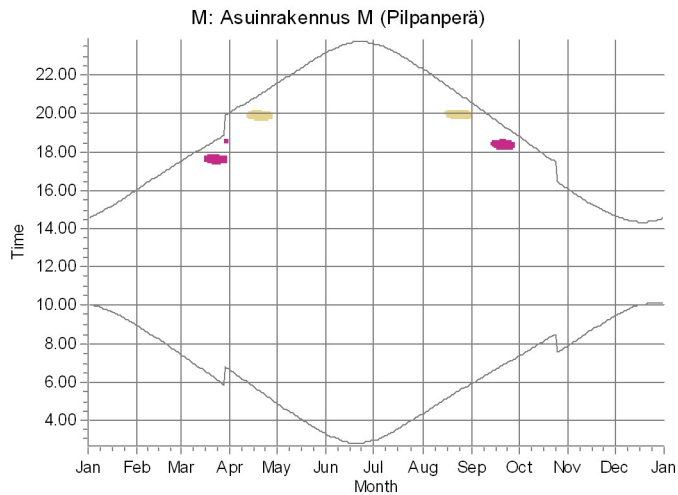
Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

3.5.2024 10.14/3.6.377

SHADOW - Calendar, graphical

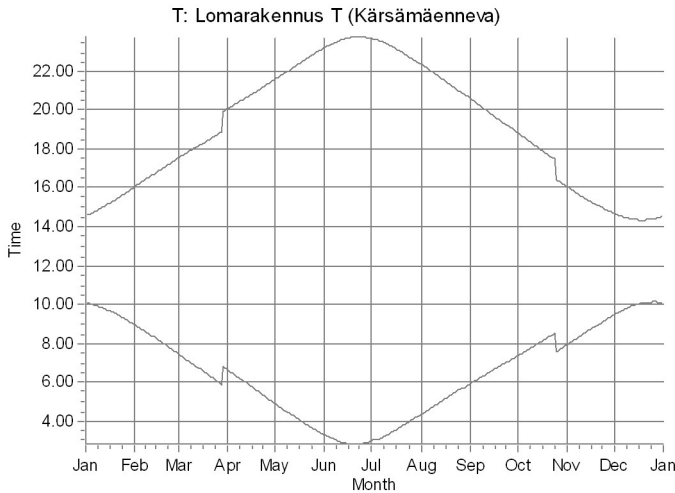
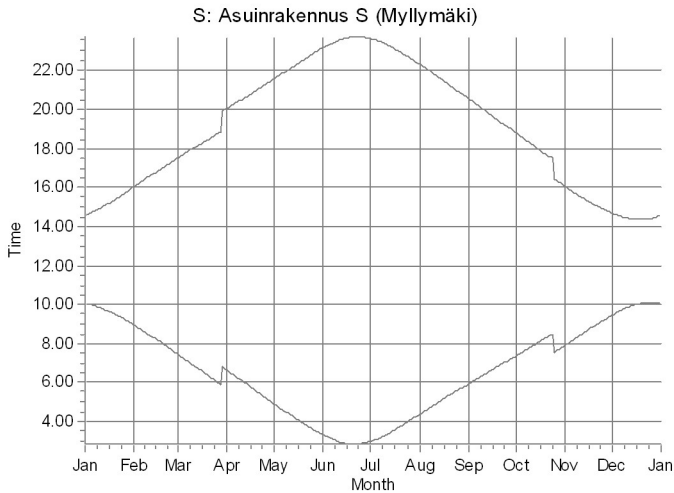
Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest



WTG: 07: Genera: 02200-44200-7200-200.0-02 Hub: 200.0-m (707-200.0-m) (274) 08: Genera: 02200-44200-7200-200.0-02 Hub: 200.0-m (707-200.0-m) (275)

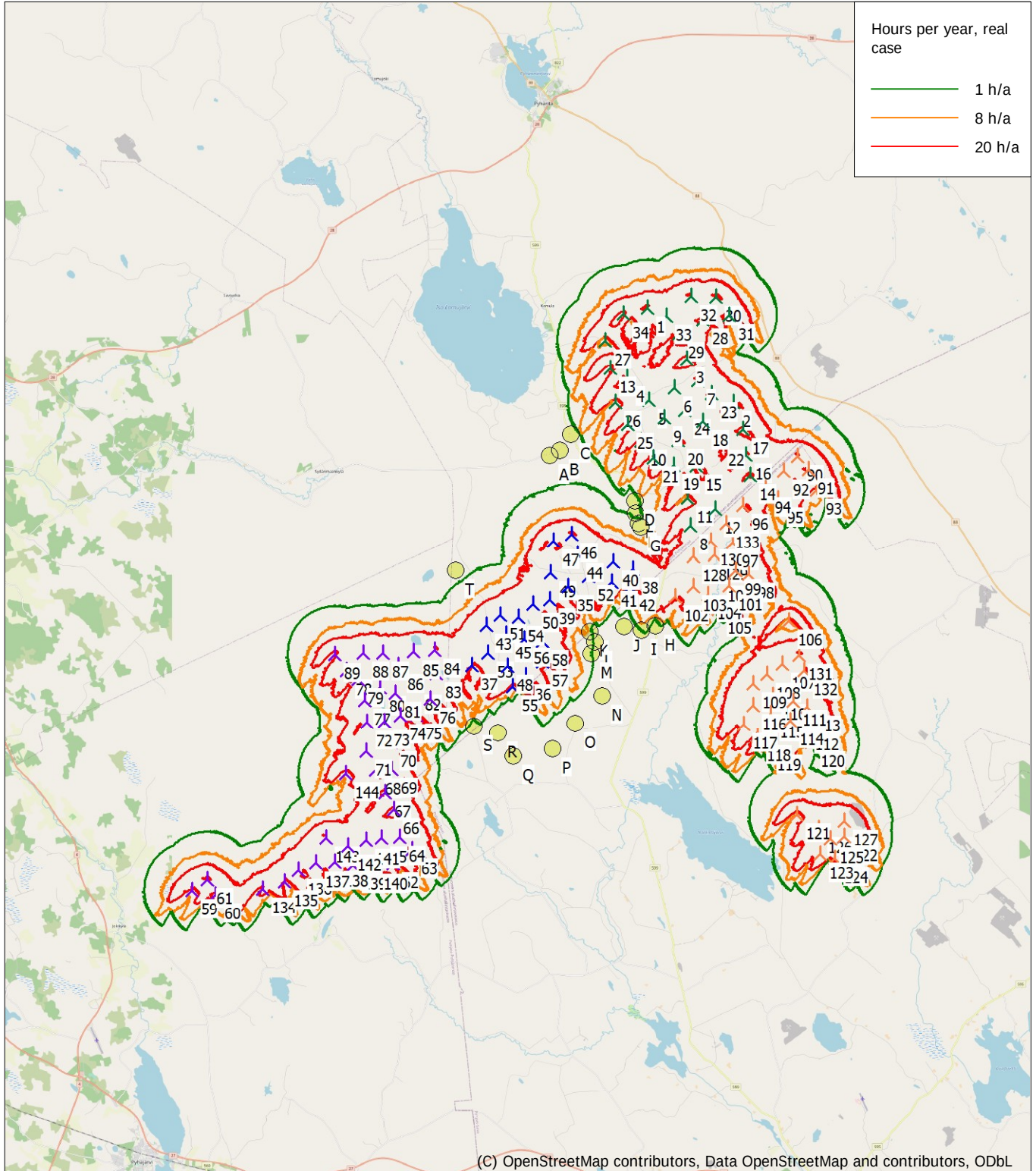
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest



SHADOW - Map

Calculation: Pilpankangas VE2_20240223_Yhteisvaikutus_No forest



Map: EMD OpenStreetMap , Print scale 1:250 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 466 420 North: 7 087 120
New WTG Shadow receptor
Flicker map level: Height Contours: CONTOURLINE_Pyhätä_Pilpankangas_0.wpo (1)
Time step: 3 minutes, Day step: 7 days, Map resolution: 20 m, Visibility resolution: 10 m, Eye height: 1,5 m

6.5.2024

Liite 18. Yhteisvaikutus varjostusmallinnuksen tulokset "real case, no forest" – Hankevaihtoehto 3 (VE3).

SHADOW - Main Result

Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest

Assumptions for shadow calculations

Maximum distance for influence

Calculate only when more than 20 % of sun is covered by the blade

Please look in WTG table

Minimum sun height over horizon for influence

3 °

Day step for calculation

1 days

Time step for calculation

1 minutes

Sunshine probability S (Average daily sunshine hours) []

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0,77	2,46	4,19	6,93	8,81	9,87	9,13	6,84	4,43	2,23	0,93	0,26

Operational hours are calculated from WTGs in calculation and wind distribution:

MERRA_N64,00_E026,002 (7)

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
534	407	418	444	537	869	1 042	1 023	923	826	708	685	8 415

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Height Contours: CONTOURLINE_Pyhäntä_Pilpankangas

Receptor grid resolution: 1,0 m

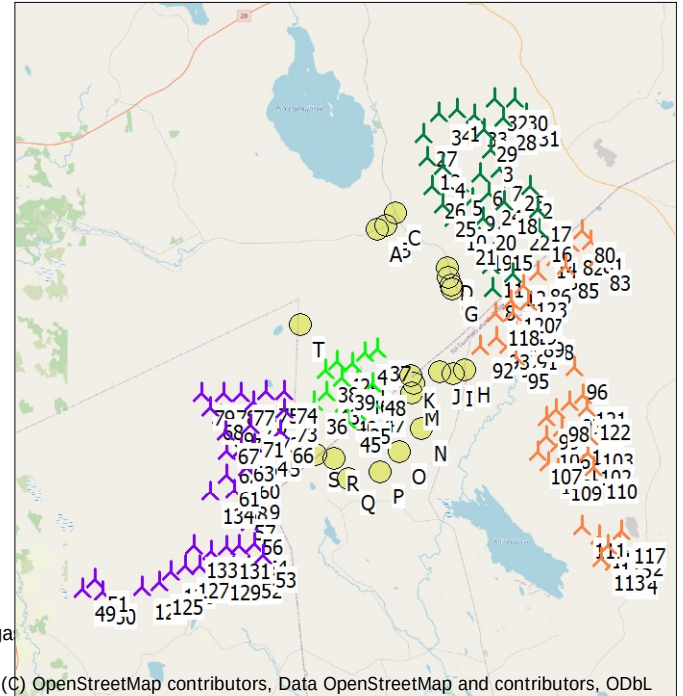
All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTGs

	East	North	Z	Row data/Description	WTG type			Power, rated [kW]	Rotor diameter [m]	Shadow data		
					Valid	Manufact.	Type-generator			Hub height [m]	Calculation distance [m]	RPM [RPM]
1	471 839	7 098 977	152,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
2	475 592	7 094 825	177,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
3	473 530	7 096 766	168,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
4	470 952	7 095 933	163,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
5	471 895	7 094 973	170,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
6	472 999	7 095 500	175,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
7	474 026	7 095 796	179,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
8	473 642	7 089 459	165,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
9	472 556	7 094 191	172,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
10	471 545	7 093 189	175,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
11	473 523	7 090 697	166,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
12	474 724	7 090 192	163,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
13	470 207	7 096 391	155,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
14	476 298	7 091 642	169,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
15	473 955	7 092 082	169,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
16	476 097	7 092 538	175,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
17	475 979	7 093 646	177,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
18	474 232	7 094 014	173,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
19	472 921	7 092 121	171,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
20	473 133	7 093 196	170,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
21	472 045	7 092 434	174,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
22	474 928	7 093 153	170,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
23	474 653	7 095 212	177,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
24	473 450	7 094 501	175,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
25	470 952	7 093 929	178,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
26	470 430	7 094 892	173,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
27	469 994	7 097 616	152,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
28	474 257	7 098 465	167,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
29	473 217	7 097 856	165,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
30	474 833	7 099 446	158,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
31	475 413	7 098 667	166,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
32	473 764	7 099 462	155,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4

To be continued on next page...



SHADOW - Main Result

Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest

...continued from previous page

	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM [RPM]
			[m]									
33	472 690	7 098 642	163,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
34	470 814	7 098 750	149,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 600	6 600	200,0	200,0	2 086	10,4
35	466 361	7 082 992	166,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
36	464 036	7 083 492	147,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
37	467 461	7 086 317	159,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
38	464 686	7 085 217	154,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
39	465 536	7 084 792	162,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
40	465 586	7 083 442	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
41	466 761	7 086 117	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
42	465 286	7 085 667	158,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
43	464 736	7 084 017	151,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
44	466 111	7 085 542	160,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
45	465 786	7 082 517	166,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
46	466 336	7 084 592	161,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
47	467 111	7 083 592	159,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
48	467 136	7 084 492	159,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 216	10,4
49	451 581	7 073 772	158,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
50	452 643	7 073 538	167,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
51	452 257	7 074 208	165,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
52	460 464	7 074 829	160,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
53	461 281	7 075 412	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
54	460 757	7 075 976	167,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
55	459 969	7 075 947	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
56	460 546	7 077 169	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
57	460 145	7 077 917	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
58	459 750	7 078 896	159,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
59	460 442	7 078 943	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
60	460 444	7 080 110	153,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
61	459 354	7 079 749	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
62	459 388	7 081 028	159,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
63	460 134	7 081 058	153,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
64	460 841	7 081 305	154,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
65	461 555	7 081 300	161,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
66	462 188	7 082 027	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
67	459 303	7 081 995	159,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
68	458 512	7 083 293	159,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
69	459 029	7 082 918	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
70	460 005	7 082 543	155,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
71	460 674	7 082 318	170,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
72	461 562	7 082 598	157,2	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
73	462 456	7 083 133	142,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
74	462 420	7 084 164	147,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
75	461 480	7 084 123	147,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
76	460 791	7 083 521	156,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
77	460 145	7 084 063	157,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
78	459 285	7 084 065	159,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
79	458 038	7 084 037	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-5 700	5 700	200,0	200,0	2 086	10,4
80	478 336	7 092 455	177,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
81	478 845	7 091 899	190,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
82	477 742	7 091 824	177,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
83	479 177	7 090 979	185,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
84	476 955	7 091 051	172,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
85	477 487	7 090 620	182,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
86	475 964	7 090 352	164,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
87	475 501	7 088 705	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
88	476 189	7 087 343	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
89	475 611	7 087 510	161,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
90	474 845	7 087 199	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
91	475 310	7 086 848	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
92	472 937	7 086 386	170,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
93	473 780	7 086 830	165,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
94	474 399	7 086 459	160,6	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
95	474 825	7 085 835	158,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
96	477 918	7 085 282	163,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4

To be continued on next page...

SHADOW - Main Result

Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest

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	East	North	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM [RPM]
			[m]									
97	477 610	7 083 418	159,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
98	476 957	7 082 967	158,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
99	476 370	7 082 551	156,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
100	477 187	7 082 052	160,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
101	478 121	7 081 764	160,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
102	478 641	7 080 668	158,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
103	478 709	7 081 538	163,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
104	477 972	7 080 917	155,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
105	477 084	7 081 229	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
106	476 355	7 081 601	162,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
107	475 903	7 080 778	161,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
108	476 526	7 080 222	157,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
109	476 972	7 079 815	154,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
110	478 868	7 079 944	156,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
111	478 217	7 076 798	138,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
112	480 292	7 075 796	153,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
113	479 248	7 075 045	139,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
114	479 889	7 074 867	140,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
115	479 686	7 075 714	147,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
116	479 198	7 076 190	147,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
117	480 317	7 076 500	159,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
118	473 769	7 088 131	166,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
119	474 672	7 088 183	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
120	474 559	7 088 784	163,0	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
121	478 369	7 083 786	163,1	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
122	478 581	7 083 109	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
123	475 224	7 089 562	162,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-6 800	6 800	200,0	200,0	2 086	10,4
124	454 719	7 073 768	173,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
125	455 680	7 074 064	172,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
126	456 302	7 074 586	168,4	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
127	457 041	7 074 897	162,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
128	457 886	7 074 902	159,7	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
129	458 721	7 074 755	155,9	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
130	459 613	7 074 759	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
131	459 300	7 075 859	159,8	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
132	458 492	7 075 619	157,5	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
133	457 550	7 075 973	161,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4
134	458 434	7 078 806	167,3	Generic RD200 HH20...	Yes	Generic	RD200 HH200 BW4,71-7 200	7 200	200,0	200,0	2 086	10,4

Shadow receptor-Input

No.	Name	East	North	Z	Width	Height	Elevation	Slope of	Direction mode	Eye height
				[m]	[m]	[m]	a.g.l.	window		(ZVI) a.g.l.
							[m]	[°]		[m]
A	Asuinrakennus A (Nurmiaho)	467 539	7 092 595	157,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	Asuinrakennus B (Kivikangas)	467 993	7 092 829	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	Asuinrakennus C (Koukkula)	468 457	7 093 473	150,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	Asuinrakennus D (Konola)	471 232	7 090 571	195,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	Asuinrakennus E (Piippo)	471 264	7 090 018	198,6	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	Asuinrakennus F (Pääkkö)	471 380	7 089 598	200,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	Lomarakennus G (Pääkkölä)	471 494	7 089 419	197,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	Asuinrakennus H (Peltola)	472 092	7 085 100	169,9	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	Asuinrakennus I (Nuuttila)	471 499	7 084 904	165,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	Lomarakennus J (Ahmokangas)	470 723	7 085 089	155,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	Asuinrakennus K (Ketola)	469 203	7 084 876	145,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	Asuinrakennus L (Tuohipuro)	469 423	7 084 440	143,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
M	Asuinrakennus M (Pilpanperä)	469 264	7 083 942	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
N	Asuinrakennus N (Hanhikaarto)	469 753	7 082 056	142,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
O	Asuinrakennus O (Ketola)	468 542	7 080 851	149,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
P	Lomarakennus P (Kuistila)	467 531	7 079 776	162,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
Q	Asuinrakennus Q (Hautalehto)	465 810	7 079 440	141,8	5,0	5,0	1,0	90,0	"Green house mode"	6,0
R	Lomarakennus R (Korpelanperä)	465 124	7 080 510	140,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
S	Asuinrakennus S (Myllymäki)	464 106	7 080 779	139,3	5,0	5,0	1,0	90,0	"Green house mode"	6,0
T	Lomarakennus T (Kärsämäenneva)	463 349	7 087 611	152,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0

SHADOW - Main Result

Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours per year [h/year]
A	Asuinrakennus A (Nurmiaho)	0:00
B	Asuinrakennus B (Kivikangas)	0:00
C	Asuinrakennus C (Koukkula)	0:00
D	Asuinrakennus D (Konola)	0:00
E	Asuinrakennus E (Piippo)	0:00
F	Asuinrakennus F (Pääkkö)	0:00
G	Lomarakennus G (Pääkkölä)	0:00
H	Asuinrakennus H (Peltola)	0:00
I	Asuinrakennus I (Nuuttila)	5:08
J	Lomarakennus J (Ahmokangas)	0:00
K	Asuinrakennus K (Ketola)	1:41
L	Asuinrakennus L (Tuohipuro)	0:00
M	Asuinrakennus M (Pilpanperä)	3:50
N	Asuinrakennus N (Hanhikaarto)	0:00
O	Asuinrakennus O (Ketola)	0:00
P	Lomarakennus P (Kuistila)	0:00
Q	Asuinrakennus Q (Hautalehto)	0:00
R	Lomarakennus R (Korpelanperä)	0:00
S	Asuinrakennus S (Myllymäki)	0:00
T	Lomarakennus T (Kärsämäenneva)	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
1	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (450)	0:00
2	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (451)	0:00
3	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (452)	0:00
4	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (453)	0:00
5	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (454)	0:00
6	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (455)	0:00
7	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (456)	0:00
8	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (457)	0:00
9	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (458)	0:00
10	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (459)	0:00
11	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (460)	0:00
12	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (461)	0:00
13	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (462)	0:00
14	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (463)	0:00
15	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (464)	0:00
16	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (465)	0:00
17	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (466)	0:00
18	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (467)	0:00
19	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (468)	0:00
20	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (469)	0:00
21	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (470)	0:00
22	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (471)	0:00
23	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (472)	0:00
24	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (473)	0:00
25	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (474)	0:00
26	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (475)	0:00
27	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (476)	0:00
28	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (477)	0:00
29	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (478)	0:00
30	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (479)	0:00
31	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (480)	0:00
32	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (481)	0:00
33	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (482)	0:00
34	Generic RD200 HH200 BW4,71 6600 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (483)	0:00
35	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (576)	0:00
36	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (577)	0:00
37	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (578)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest

...continued from previous page

No.	Name	Expected [h/year]
38	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (579)	0:00
39	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (580)	0:00
40	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (581)	0:00
41	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (582)	0:00
42	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (583)	0:00
43	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (584)	0:00
44	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (585)	0:00
45	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (586)	0:00
46	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (587)	0:00
47	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (588)	1:34
48	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (589)	3:58
49	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (659)	0:00
50	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (660)	0:00
51	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (661)	0:00
52	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (662)	0:00
53	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (663)	0:00
54	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (664)	0:00
55	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (665)	0:00
56	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (666)	0:00
57	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (667)	0:00
58	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (668)	0:00
59	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (669)	0:00
60	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (670)	0:00
61	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (671)	0:00
62	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (672)	0:00
63	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (673)	0:00
64	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (674)	0:00
65	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (675)	0:00
66	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (676)	0:00
67	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (677)	0:00
68	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (678)	0:00
69	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (679)	0:00
70	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (680)	0:00
71	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (681)	0:00
72	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (682)	0:00
73	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (683)	0:00
74	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (684)	0:00
75	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (685)	0:00
76	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (686)	0:00
77	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (687)	0:00
78	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (688)	0:00
79	Generic RD200 HH200 BW4,71 5700 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (689)	0:00
80	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (795)	0:00
81	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (796)	0:00
82	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (797)	0:00
83	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (798)	0:00
84	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (799)	0:00
85	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (800)	0:00
86	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (801)	0:00
87	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (802)	0:00
88	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (803)	0:00
89	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (804)	0:00
90	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (805)	0:00
91	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (806)	0:00
92	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (807)	5:08
93	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (808)	0:00
94	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (809)	0:00
95	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (810)	0:00
96	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (811)	0:00
97	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (812)	0:00
98	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (813)	0:00
99	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (814)	0:00
100	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (815)	0:00
101	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (816)	0:00
102	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (817)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest

...continued from previous page

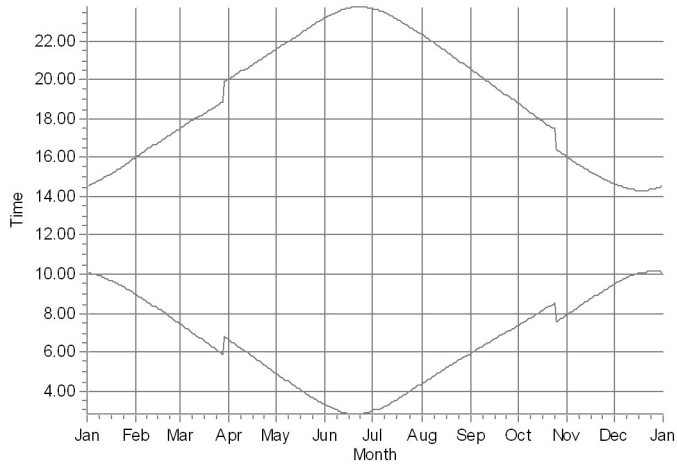
No.	Name	Expected [h/year]
103	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (818)	0:00
104	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (819)	0:00
105	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (820)	0:00
106	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (821)	0:00
107	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (822)	0:00
108	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (823)	0:00
109	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (824)	0:00
110	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (825)	0:00
111	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (826)	0:00
112	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (827)	0:00
113	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (828)	0:00
114	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (829)	0:00
115	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (830)	0:00
116	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (831)	0:00
117	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (832)	0:00
118	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (833)	0:00
119	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (834)	0:00
120	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (835)	0:00
121	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (836)	0:00
122	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (837)	0:00
123	Generic RD200 HH200 BW4,71 6800 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (838)	0:00
124	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (899)	0:00
125	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (900)	0:00
126	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (901)	0:00
127	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (902)	0:00
128	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (903)	0:00
129	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (904)	0:00
130	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (905)	0:00
131	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (906)	0:00
132	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (907)	0:00
133	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (908)	0:00
134	Generic RD200 HH200 BW4,71 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (909)	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

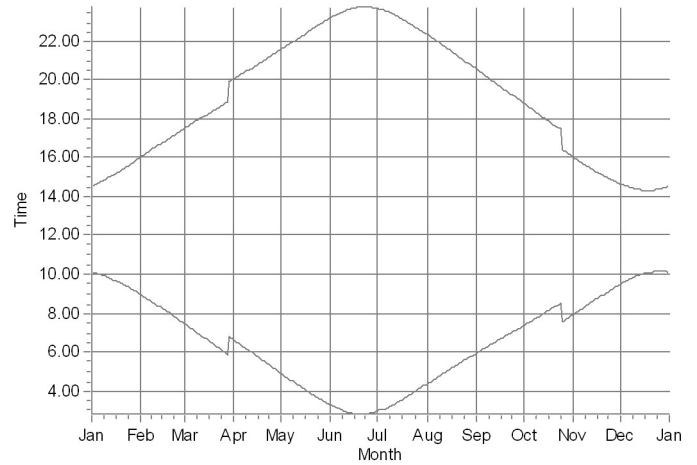
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest

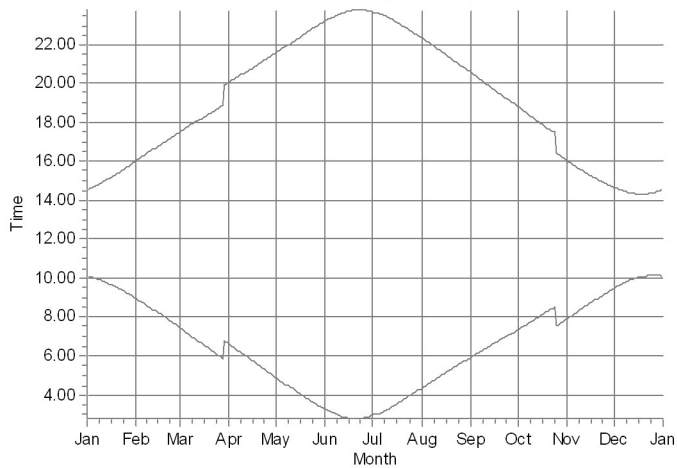
A: Asuinrakennus A (Nurmiaho)



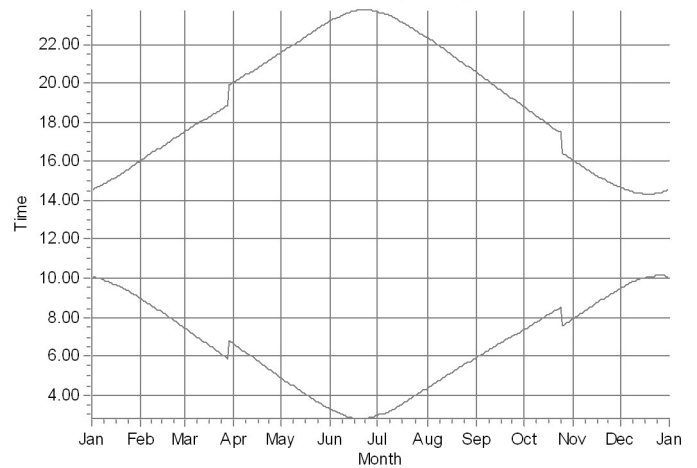
B: Asuinrakennus B (Kivikangas)



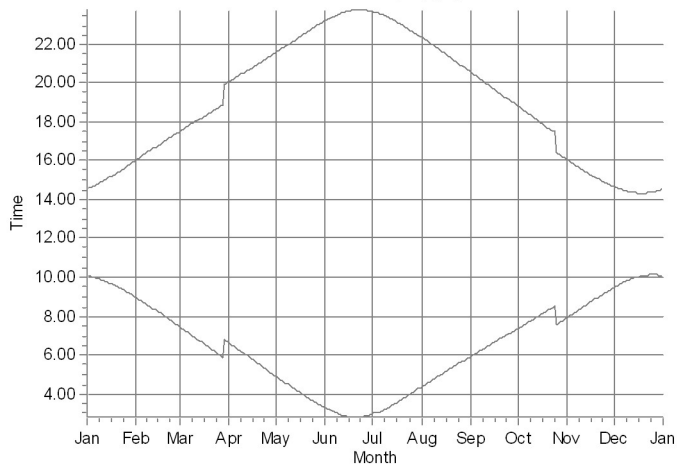
C: Asuinrakennus C (Koukkula)



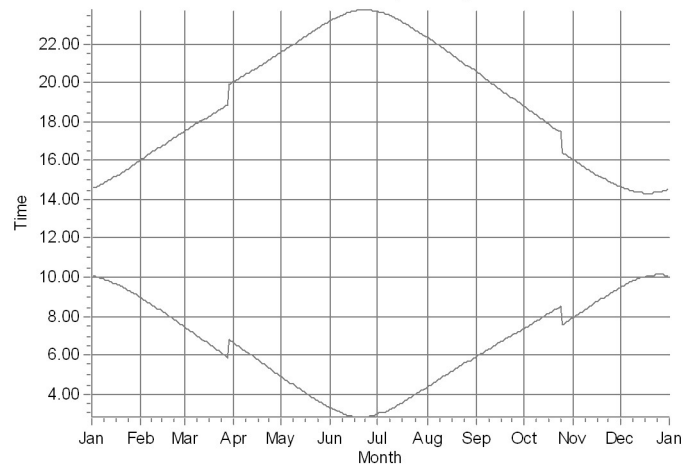
D: Asuinrakennus D (Konola)



E: Asuinrakennus E (Piippo)



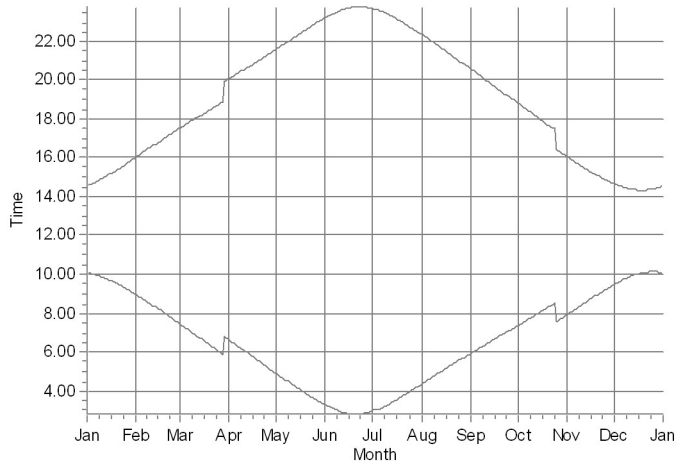
F: Asuinrakennus F (Pääkkö)



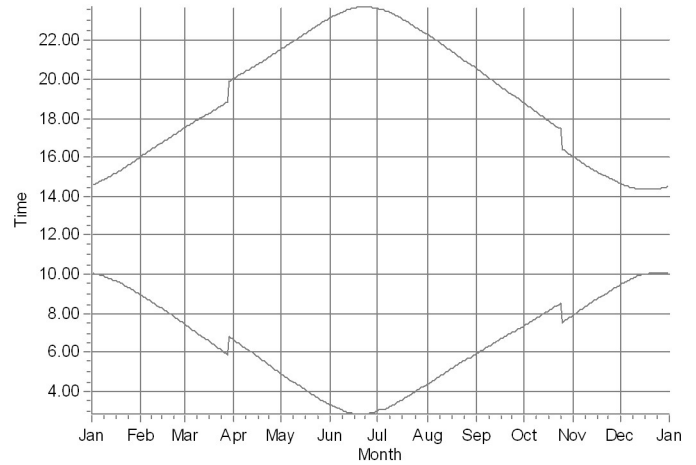
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest

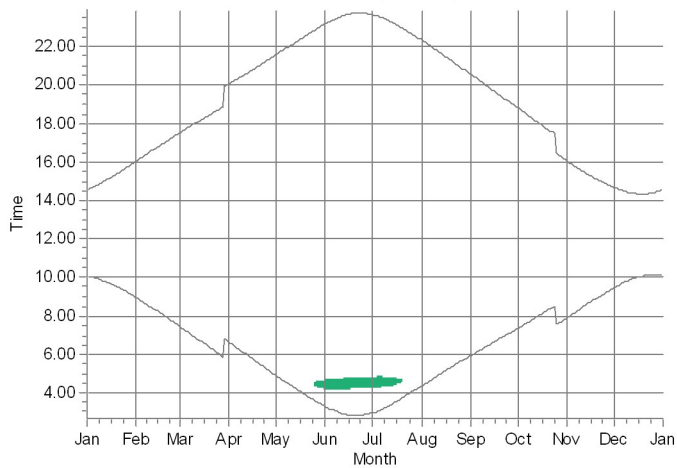
G: Lomarakennus G (Pääkkölä)



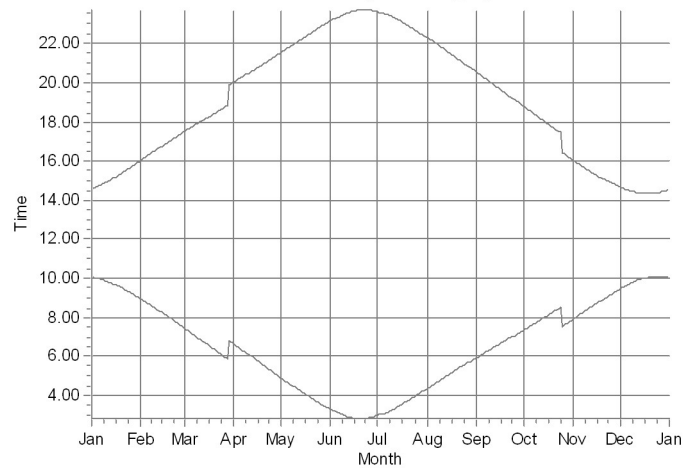
H: Asuinrakennus H (Peltola)



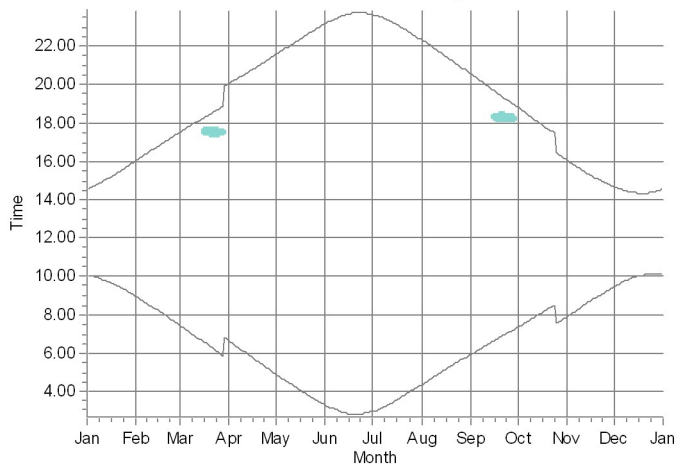
I: Asuinrakennus I (Nuuttila)



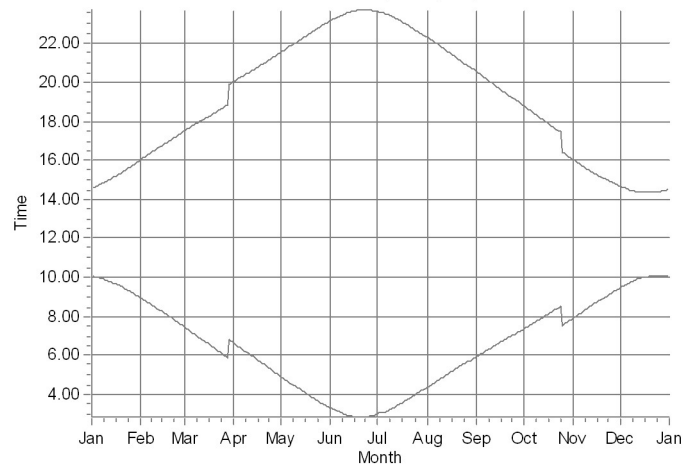
J: Lomarakennus J (Ahmokangas)



K: Asuinrakennus K (Ketola)



L: Asuinrakennus L (Tuohipuro)



WTS

40: Genset R2200 H4200 1200 200.0 m (107: 300.0 m) (S8)

50: Genset R2200 H4200 1200 200.0 m (107: 300.0 m) (S8)

Project:

Pyhätä_Pilpankangas

Licensed user:

FCG Finnish Consulting Group Oy

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+358104095666

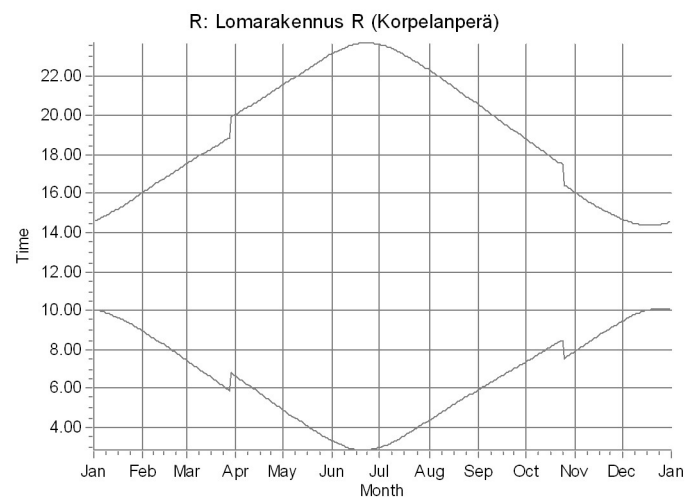
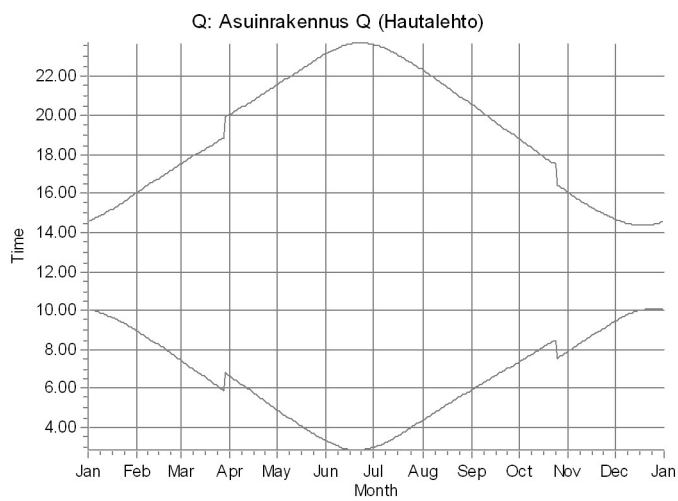
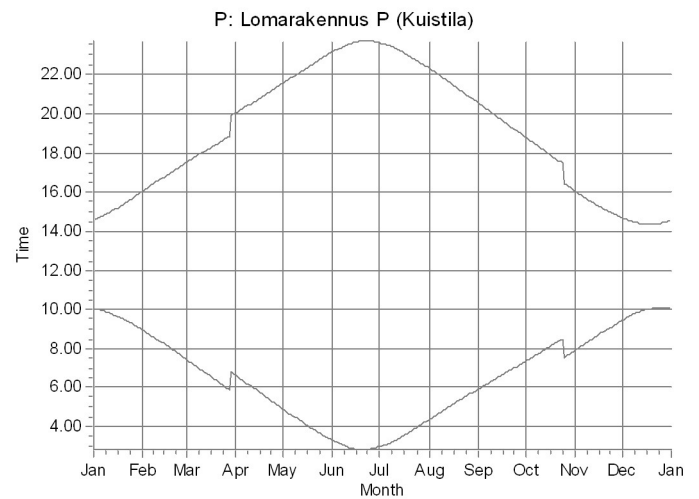
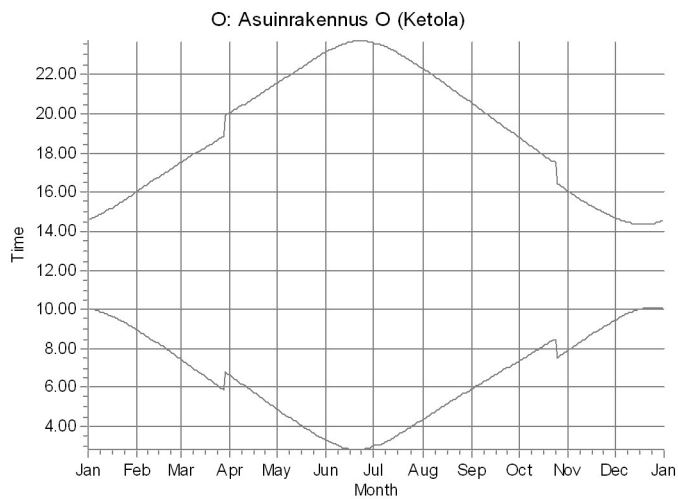
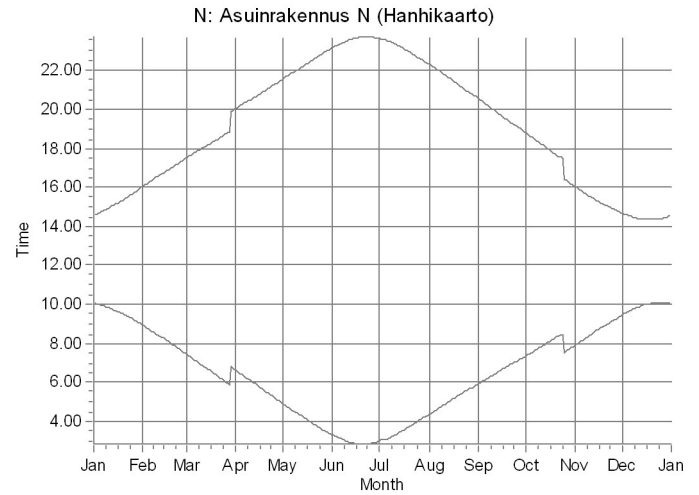
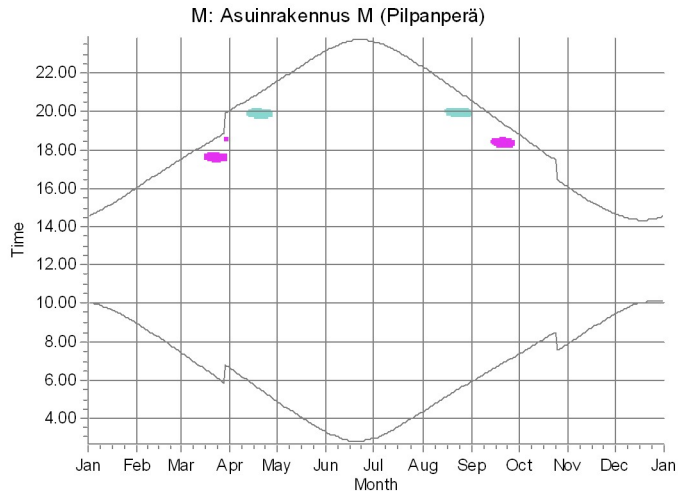
Aarni Nikkola / aarni.nikkola@fcg.fi

Calculated:

6.5.2024 11.26/3.6.377

SHADOW - Calendar, graphical

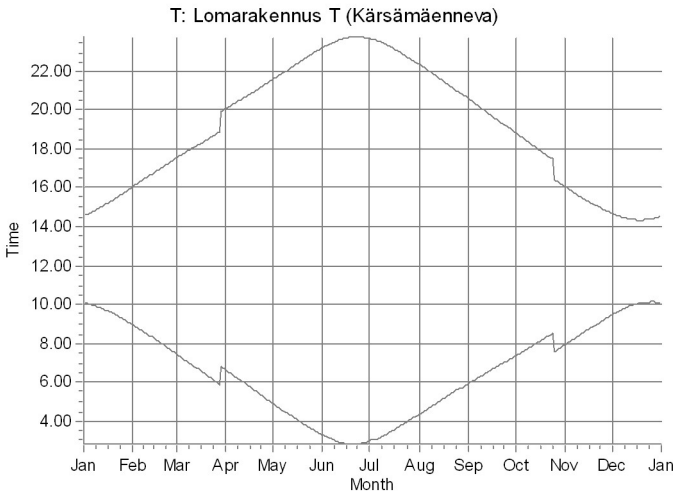
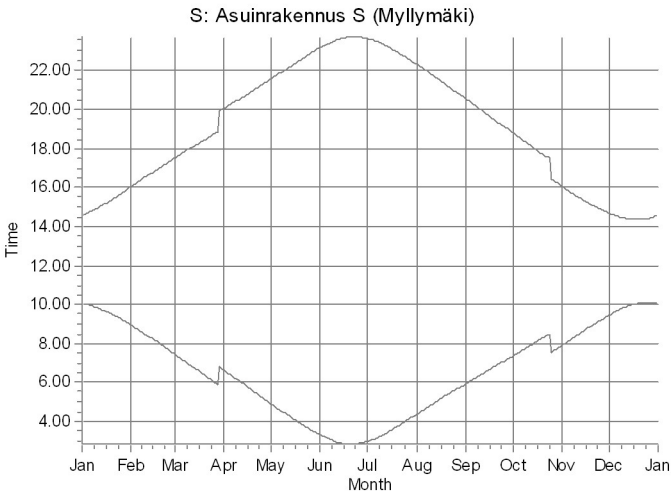
Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest



WTS
47: GeraRD200 140200 1200 200.0 m (T07: 300.0 m) (SRR)
48: GeraRD200 140200 1200 200.0 m (T07: 300.0 m) (SRR)

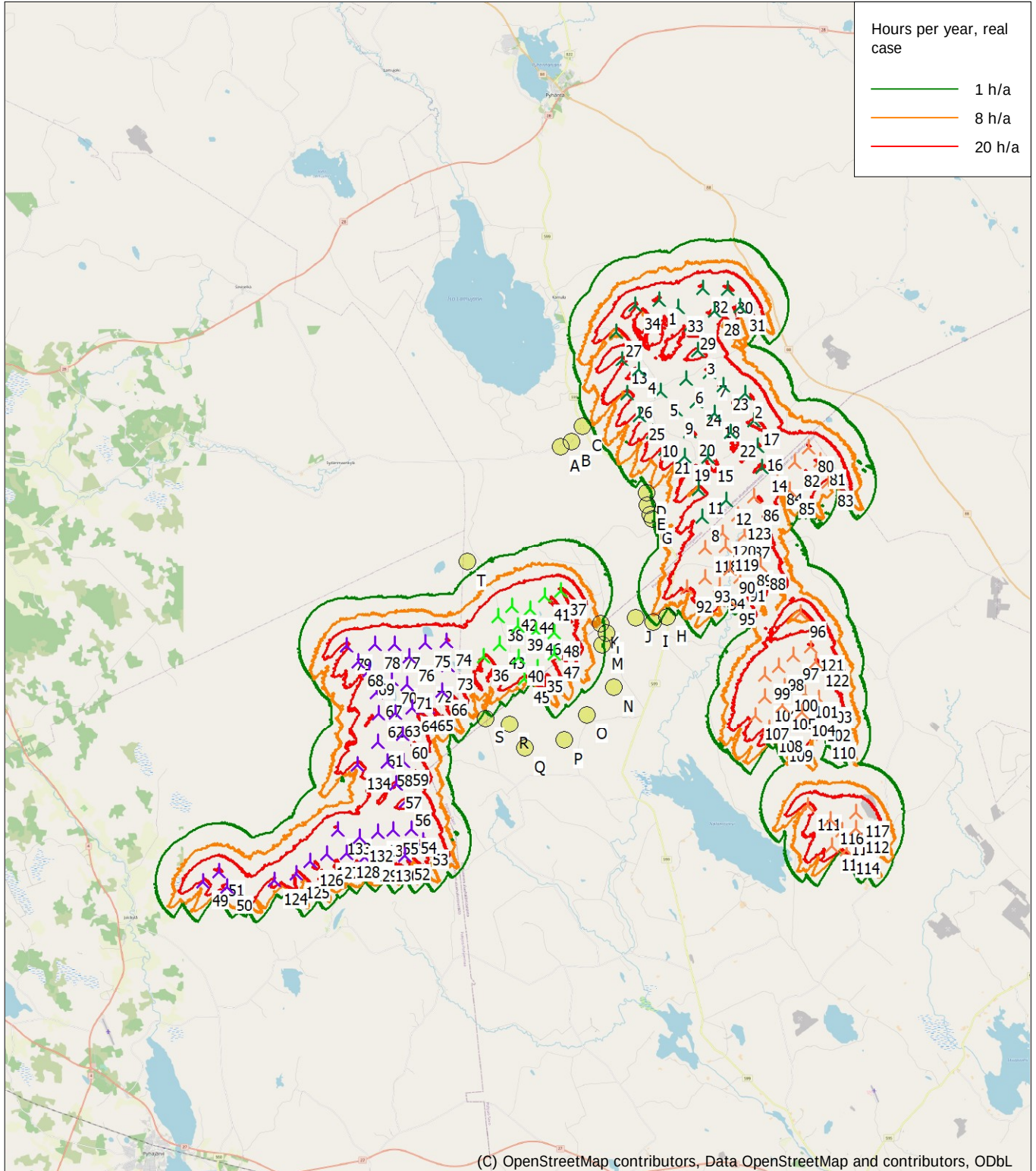
SHADOW - Calendar, graphical

Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest



SHADOW - Map

Calculation: Pilpankangas VE3_20240223_Yhteisvaikutus_No forest



Map: EMD OpenStreetMap , Print scale 1:250 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 465 920 North: 7 086 760
New WTG Shadow receptor
Flicker map level: Height Contours: CONTOURLINE_Pyhäntä_Pilpankangas_0.wpo (1)
Time step: 3 minutes, Day step: 7 days, Map resolution: 20 m, Visibility resolution: 10 m, Eye height: 1,5 m