



Finnish
Consulting
Group

Jolkka vindkraftsprojekt, Kro- noby

BILAGA 7A: RAPPORT ÖVER BULLER- OCH SKUGGMODELLERING

Innehållsförteckning

1 Buller- och skuggningsmodelleringens mål	3
1.1 Utgångsuppgifter och metoder	3
1.2 Buller	3
1.2.1 Bullermodellering ISO 9613-2	3
1.2.2 Lågfrekvent buller	7
1.2.3 Skuggmodellering	8
1.2.4 Beräkningspunkter för modelleringarna	9
1.3 Gräns- och riktvärden	9
1.3.1 Buller	9
1.3.2 Skuggeffekter	10
2 Resultat av buller- och skuggningsmodelleringarna	11
2.1 Buller	11
2.1.1 Projektalternativ ALT1: Beräkningsresultat för buller (ISO 9613-2)	11
2.1.2 Projektalternativ ALT2: Beräkningsresultat för buller (ISO 9613-2)	12
2.1.3 Lågfrekventa bullernivåer	14
2.2 Skuggeffekter	16
3 Resultat av modellering av sammantaget buller och sammantagna skuggeffekter ...	23
3.1 Buller	23
3.1.1 Projektalternativ ALT1: Beräkningsresultat för sammantaget buller	23
3.1.2 Projektalternativ ALT2: Beräkningsresultat för sammantaget buller	24
3.1.3 Lågfrekventa bullernivåer	26
3.2 Skuggeffekter	28
Källor	34

17.02.2026

Bilagor (MKB-beskrivningens bilaga 7B)

Bilaga 1. Resultat från modelleringen av spridningen av buller ISO 9613-2, YM 2 /2014 - Projekialternativ ALT1

Bilaga 2. Resultat från modelleringen av spridningen av buller ISO 9613-2, YM 2 /2014 - Projekialternativ ALT2

Bilaga 3. Värden för lågfrekvent buller vid olika byggnader - Projekialternativ ALT1

Bilaga 4. Värden för lågfrekvent buller vid olika byggnader - Projekialternativ ALT2

Bilaga 5. Skuggmodelleringens resultat "real case, no forest" - Projekialternativ ALT1

Bilaga 6. Skuggmodelleringens resultat "real case, luke forest" - Projekialternativ ALT1

Bilaga 7. Skuggmodelleringens resultat "real case, no forest" - Projekialternativ ALT2

Bilaga 8. Skuggmodelleringens resultat "real case, luke forest" - Projekialternativ ALT2

Bilaga 9. Resultat av modellering av sammantaget buller - Projekialternativ ALT1

Bilaga 10. Resultat av modellering av sammantaget buller - Projekialternativ ALT2

Bilaga 11. Värden för sammantaget buller vid olika byggnader - Projekialternativ ALT1

Bilaga 12. Värden för sammantaget buller vid olika byggnader - Projekialternativ ALT2

Bilaga 13. Resultat av modelleringen av sammantagna skuggeffekter "Real Case, No Forest" - Projekialternativ ALT1

Bilaga 14. Resultat av modelleringen av sammantagna skuggeffekter "Real Case, Luke Forest" - Projekialternativ ALT1

Bilaga 15. Resultat av modelleringen av sammantagna skuggeffekter "Real Case, No Forest" - Projekialternativ ALT2

Bilaga 16. Resultat av modelleringen av sammantagna skuggeffekter "Real Case, Luke Forest" - Projekialternativ ALT2

17.02.2026

1 Buller- och skuggmodelleringens mål

Den ansvariga för Jolkka vindkraftsprojekt Renantis Finland Oy planerar byggande av 9 kraftverk i alternativ 1 (ALT1) och 7 kraftverk i alternativ 2 (ALT2). I rapporten undersöks sammantagna konsekvenser med de närliggande projekten Pihtineva och Saarukka vindkraftsprojekt. Denna rapport över buller- och skuggmodelleringen har utarbetats utifrån layoutplanerna i MKB-beskrivningsskedet för Jolkka vindkraftsprojekt.

De bullerkonsekvenser som vindkraftverken orsakar har bedömts med WindPRO-programmets DECIBEL-modul. Vindkraftverkens skuggeffekter har modellerats med hjälp av WindPRO-programmets SHADOW-modul. Buller- och skuggmodelleringarna har gjorts av Henri Korhonen och kvalitetsgranskningen av ingenjör (YH) Johanna Harju från FCG Rakennettu Ympäristö Oy.

1.1 Utgångsuppgifter och metoder

1.2 Buller

1.2.1 Bullermodellering ISO 9613-2

De ljudtrycksnivåer som vindkraftverken orsakar har modellerats med WindPRO-programmets Decibel-modul enligt standarden ISO 9613-2. I enlighet med Miljöförvaltningens anvisning för modellering av buller från vindkraftverk användes en vindhastighet på 8 m/s mätt på 10 meters höjd, en lufttemperatur på 15 °C, ett lufttryck på 101,325 kPa, en relativ luftfuktighet på 70 procent och en markhårdhet på 0,4 i markområden och 0,0 i vattenområden. Beräkningen har gjorts 4,0 meter över markytan. Beräkningsinställningarna presenteras i tabell 4.

Ljudtrycksnivåerna från Jolkka vindkraftverk har i alla projekteralternativ modellerats med kraftverksmodellen Vestas V172-7.2MW som har en rotordiameter på 172 meter. I modelleringarna har kraftverken har en navhöjd på 209 meter, vilket innebär att kraftverkets totala höjd är 295 meter.

Som ljudeffektsnivå (LWA) för kraftverket V172-7.2MW användes 107,8 dB(A). Detta är ett garantivärde (Tabell 1) som uppgetts av kraftverkstillverkaren när kraftverkets bladtyp är "with serrated trailing edge", det vill säga att bladens kant har sågtandade element som dämpar buller. I modelleringarna har en separat säkerhetsmarginal därför inte lagts till den utgångsbullernivå som meddelats av tillverkaren.

Vid bedömningen av sammantaget buller beaktades utöver de planerade vindkraftverken i Jolkka även Pihtineva och Saarukka vindkraftsprojekt. De planerade kraftverken i Pihtineva har beaktats i enlighet med projekteralternativ 1 (ALT1) i projektets MKB-beskrivning (86 st.). Kraftverksuppgifterna har erhållits av projektets MKB-konsult. Saarukka vindkraftsprojekt har modellerats baserat på uppgifter som erhållits av projektaktören. Uppgifter om projektets kraftverk har presenterats i tabellerna 1–3.

Beräkningsresultaten från bullermodelleringarna har åskådliggjorts med hjälp av så kallade kartor över medelljudnivåer. På kartorna över medelljudnivåer presenteras kurvor över bullrets medelljudnivå dvs. ekvivalensljudnivå (LAeq) med 5 dB:s mellanrum.

17.02.2026

Tabell 1. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Jolkka vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 4.2.285				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKEN							
Vindkraftverkets tillverkare: Vestas				Typ: V172 – 7,2 MW		Serienummer: -	
Nominell effekt: 7,2 MW		Navhöjd: 209 m		Rotorns diameter: 172 m		Torntyp: stål/hybrid	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad: PO7200 (STE)			
Ja	dB	Ja	dB	Noise mode-reglering:			
Nej		Nej		Noise mode, utgångsbullernivå		107,8 dB(A)	
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							
Third octave noise emission EnVentus™ V172 Document no 0128-4336_01							
Vestas: Our largest rotor and generator onshore is V172-7.2 MW, and the maximum sound level is 107.8 dB(A). That is the level that we as supplier are warranting.							
Oktavvis [Hz], dB(A)		Per 1/3-oktav [Hz], dB(A)					
		12,5	53,4	125	92	1250	96
62,5	89,8	16,0	58,1	160	93,6	1600	95,5
125	96,8	20	62,7	200	95,7	2000	95,2
250	101,4	25	67,9	250	97,2	2500	94,6
500	100,4	31,5	72,6	315	96,9	3150	94,8
1000	101	40	76,4	400	95,8	4000	94,3
2000	99	50	81	500	95,4	5000	90
4000	98,3	63	84,9	630	95,6	6300	83,7
8000	85,5	80	87,2	800	96,2	8000	79,4
107,8 dB(A)		100	89,7	1000	96,4	10000	75,2
Mätning och observationer av bullrets särdrag:							
Smalbandighet/Tonalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
Ja	Nej	Ja	Nej	Ja	Nej	Ja	Nej

17.02.2026

Tabell 2. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Pihtineva vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 4.2.285				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET (VINDKRAFTVERKEN)							
Vindkraftverkets tillverkare: GE Renewable Energy				Typ: GE158		Serienummer: -	
Nominell effekt: 6,1 MW		Navhöjd: 221 m		Rotorns diameter: 158 m		Torntyp: stål/hybrid	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad			
Ja	- dB	Ja	- dB	Noise mode-reglering: Mode 0, No STE			
Nej		Nej		Noise mode, utgångsbullernivå		107.0 dB + 3dB	
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							
Noise_Emission_4.x_5.x_6.x-158-50Hz_IEC_EN_r01							
Den ljudeffektsnivå som tillverkaren uppgett för kraftverket motsvarar medelljudnivån och genom att tillägga en säkerhetsmarginal på 2 dB(A) fås en ljudeffektsnivå som motsvarar garantivärdet. I utgångsbullernivån tillades dessutom ytterligare 1 dB(A) på begäran av projektaktören för Pihtineva.							
Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20	67,1	200	94,5	1600	99,9
63	91,2	25	71,8	250	96	2000	98,5
125	96,4	31,5	76,2	315	97,3	2500	96,5
250	100,9	40	80,1	400	97,9	3150	93,9
500	103,4	50	83,4	500	98,7	4000	89,9
1000	105,4	63	86,2	630	99,3	5000	85,8
2000	103,3	80	88,4	800	100	6300	79,3
4000	95,8	100	90	1000	100,6	8000	69,7
8000	79,8	125	91,5	1250	101,2	10000	57,1
110 dB(A)		160	92,9				
Mätning och observationer av bullrets särdrag:							
Smalbandighet/To- nalitet		Impulsartat buller		Amplitudmodulation		Annat, vad:	
Ja	Nej	Ja	Nej	Ja	Nej	Ja	Nej

17.02.2026

Tabell 3. Modelleringsprogram och ljudeffektsnivåer för vindkraftverken samt bullrets särdrag för Saarukka vindkraftsprojekt.

UPPGIFTER OM MODELLERINGSPROGRAMMET							
Modelleringsprogram och version: WindPRO version 4.2.285				Modelleringsmetod: ISO 9613-2			
UPPGIFTER OM VINDKRAFTVERKET (VINDKRAFTVERKEN)							
Vindkraftverkets tillverkare: Nordex				Typ: N175		Serienummer: -	
Nominell effekt: 6,8 MW		Navhöjd: 212,5 m		Rotorns diameter: 175 m		Torntyp: stål/hybrid	
Möjligheter att påverka vindkraftverkets bullerutsläpp under driften och dess inverkan på bullret							
Reglering av bladvinkeln		Rotationshastighet		Annat, vad			
Ja	- dB	Ja	- dB	Noise mode-reglering: Mode 0, STE			
Nej		Nej		Noise mode, utgångsbullernivå			106,9dB + 1,5dB
AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN							
Third octave sound power levels F008_278_A17_EN Revision 03, 13.10.2023							
Den ljudeffektsnivå som tillverkaren uppgett för kraftverket motsvarar medelljudnivån och genom att tillägga en säkerhetsmarginal på 1,5 dB(A) fås en ljudeffektsnivå som motsvarar garantivärdet.							
Oktavvis [Hz],dB(A)		1/3-oktavvis [Hz] LWA dB					
		20	73,3	200	96,0	1600	97,5
63	91,2	25	76,7	250	96,5	2000	96,1
125	98,0	31,5	78,6	315	97,3	2500	92,9
250	101,4	40	79,8	400	97,2	3150	89,6
500	101,9	50	81,8	500	97	4000	85,3
1000	102,8	63	86,1	630	97,3	5000	81,2
2000	100,7	80	88,8	800	98	6300	74,1
4000	91,4	100	90,4	1000	98	8000	66,4
8000	74,9	125	93	1250	98,2	10000	57
108,4 dB(A)		160	95				
Mätning och observationer av bullrets särdrag:							
Smalbandighet/Tonalitet		Impulsartat buller		Amplitudmodulation			Annat, vad:
Ja	Nej	Ja	Nej	Ja	Nej	Ja	Nej

17.02.2026

Tabell 4. Tillämpade modelleringsparametrar vid ISO 9613-2-beräkningar

AKUSTISKA UPPGIFTER/UTGÅNGSUPPGIFTER FÖR KALKYLERINGEN			
Beräkningshöjd		Beräkningsrutans storlek [m·m]	
ISO 9613-2: 4,0 m		50x50 m	
Relativ fuktighet		Temperatur	
70 %	Annat, vad och varför:	ISO 9613-2: 15 C°	
Terrängmodellens källa och noggrannhet			
Terrängmodellens källa: LMV terrängdatabas		Horisontell resolution: 1,0	Vertikal resolution: 0,5
Beaktande av mark- och vattenytans absorption och reflektion, använda koefficienter			
ISO 9613-2	markyta 0.4	vattenområden 0.0	Obs
Atmosfärens stabilitet vid beräkningen/meteorologisk korrigering			
Neutral, (0): Neutral		Annat, vad och varför:	
Beaktande av väderförhållanden; vindriktningar och hastighet som använts vid beräkningen			
Vindens riktning: 0-360°		Vindhastighet: 8 m/s uppmätt på 10 meters höjd	
Riktning för kraftverkets ljud och dämpning			
Fri rymd: ja		Annat, vad och varför:	

1.2.2 Lågfrekvent buller

Det lågfrekventa bullret beräknades med metoder enligt Miljöministeriets anvisning 2/2014 och med uppskattningar av de ljudeffektsnivåer för kraftverken som erhållits från kraftverkstillverkaren.

Anvisningen 2/2014 erbjuder en metod för beräkning av lågfrekvent buller utanför byggnader. I social- och hälsoministeriets förordning om boendehälsa fastställs åtgärdsbegränsningar för lågfrekvent buller i bostadsrum. Ljudnivån som sprids till insidan av byggnaderna kalkylerades med hjälp av ljudisoleringsresultat från Åbo yrkeshögskolas Anojanssi-projekt (Keränen, Hakala och Hongisto 2017) och resultaten jämfördes med åtgärdsgränserna.

Tabell 5. Närmevärde för ljudnivåskillnad för fasaden till ett finländskt småhus i enlighet med resultaten från Anojanssi-projektet.

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

Vid beräkningen av lågfrekvent buller beaktades effekten av markytans form enligt anvisningen 4/2014. Resultaten har presenterats i form av en tabell enligt frekvens vid bostads- och fritidsbyggnaderna i projektområdets omgivning.

17.02.2026

1.2.3 Skuggmodellering

De skuggeffekter som Jolkka vindkraftverk orsakar har modellerats med en rotordiameter på 200 meter och en tornhöjd på 195 meter i båda alternativen. Detta ger en total höjd på 295 meter.

Tabell 6. Modelleringsprogram och vindkraftverkens storlek i skuggmodelleringarna för Jolkka vindkraftsprojekt.

Uppgifter om modelleringsprogrammet			
Modelleringsprogram och version: WindPRO versioner 4.1.		Modelleringsmetod: ISO 9613-2	
Vindkraftverkets tillverkare: Generic		Typ: Generic RD200xHH195	Serienummer: -
Nominell effekt: -	Navhöjd: 195 m	Rotorns diameter: 200 m	Torntyp: stål/hybrid
Rotorbladets maximala bredd: 4,72 m	Rotorbladets bredd beräknat för 90 procents radie: 1,42 m	Maximalt skuggeffektsav- stånd: 2 083 m	

I fråga om sammantagna konsekvenser beaktades Pihtineva vindkraftverk enligt projekialternativ ALT1 i MKB-skedet samt Saarukka vindkraftsprojekt. Vindkraftverkens skuggkonsekvenser har modellerats med ett kraftverk med en rotordiameter på 200 meter och en navhöjd på 200 meter. Den totala höjden för kraftverken är då 300 meter. Skuggeffekterna för Saarukka har modellerats med ett kraftverk med en rotordiameter på 200 meter och en navhöjd på 200 meter. Den totala höjden för kraftverken är då 300 meter. I fråga om båda projekten är den maximala bredden för kraftverksbladen 4,72 meter och bladets bredd beräknat på 90 % radie 1,42 meter.

Vid beräkningen beaktas skuggor som bildas då solen ligger minst 3 grader ovanför horisonten. Som skugga räknas en situation där bladet täcker minst 20 % av solen.

Vid beräkningen för skuggmodellen beaktades projektområdets höjduppgifter, vindkraftverkens lägen, vindkraftverkens navhöjd och rotordiameter samt projektområdets tidszon. Vid modelleringen beaktades solens läge vid horisonten vid olika klockslag och årstider, molnighet per månad (med andra ord hur mycket solen lyser då den står ovanför horisonten) samt den uppskattade drifttiden för vindkraftverken per år.

Som granskningshöjd för skuggningen på gårdsplanen för bostads- eller fritidsbyggnaderna i närheten användes 1,0 meter. Beräkningsfönstrets storlek var 5,0 x 5,0 meter. Beräkningsfönstren riktades mot kraftverken i s.k. "greenhouse mode".

De genomsnittliga soltimmarerna baserar sig på långvariga väderuppgifter som uppmätts vid Umeå väderstation under åren 1988–1993. Som vindriktning och hastighetsfördelning vid beräkningarna användes Nasas MERRA-data (Modern Era Retrospective-analysis for Research and Applications) från närheten av projektområdet.

Skuggeffekterna har modellerats i två olika situationer – genom att beakta den skyddande effekten från träd (real case, luke forest) och utan att beakta den (real case, no forest). De träd som använts vid modelleringen baserar sig på Naturresursinstitutets (Luke) material från 2023.

17.02.2026

Resultaten från skuggmodelleringen åskådliggörs med hjälp av en karta. Skuggeffektens omfattning (1, 8 och 20 timmar i året) framgår av kartan. I modelleringen har också effekterna för känsliga objekt i omgivningen runt området för vindkraftsparken räknats ut separat.

1.2.4 Beräkningspunkter för modelleringarna

Modelleringarnas beräkningspunkter baserar sig på uppgifter om byggnadsbeståndet i Lantmäteriverkets Terrängdatabas där byggnadernas användningsändamål, såsom bostads- och fritidsbyggnad, framkommer.

1.3 Gräns- och riktvärden

1.3.1 Buller

I Statsrådets förordning (1107/2015) fastställs planeringsvärden för maximalvärdet för medelljudnivåerna dag- och nattetid för vindkraftverk. Om bullret från vindkraftverket innehåller tonala, smalbandiga eller impulsliknande komponenter eller om det är tydligt amplitudmodulerat, bör det enligt anvisningarna läggas till fem decibel till modelleringsresultaten innan de jämförs med riktvärdet. Eftersom riktvärdet redan omfattar de typiska dragen för buller från vindkraftverk, bör de ovan nämnda typiska dragen för ljud vara ovanligt kraftiga för att fem decibels tillägg i ljudstyrkan skulle behöva beaktas i modelleringsresultaten (Miljöförvaltningens anvisning 2/2014).

Tabell 7. Riktvärden för buller från vindkraftverk enligt Statsrådets förordning (1107/2015).

Konsekvensobjekt	Dagtid (7–22)	Nattetid (22–7)
Fast bebyggelse	45 dB	40 dB
Fritidsbebyggelse	45 dB	40 dB
Vårdanstalter	45 dB	40 dB
Läroanstalter	45 dB	—
Rekreationsområden	45 dB	—
Campingområden	45 dB	40 dB
Nationalparker	40 dB	40 dB

I social- och hälsoministeriets förordning (545/2015) fastställs åtgärdsgränser för lågfrekvent buller. Åtgärdsgränserna berör bostadsrum och de har fastställts som icke-frekvensvägda medelljudnivåer under en timme tersvis. Åtgärdsgränserna berör buller nattetid och under dagen tillåts 5 dB högre värden.

Tabell 8. Åtgärdsgränser för en timmes medelljudnivå för lågfrekvent buller inomhus på frekvensintervallet 20–200 Hz. Dessa är maximala värden som fastställts för buller nattetid i sovutrymmen.

Tersband Hz	20	25	31,5	40	50	63	80	100	125	160	200
Medelljudnivå L _{Zeq} ,1h, dB	74	64	56	49	44	42	40	38	36	34	32
Medelljudnivå beräknat utifrån föregående med A-vägning L _{Aeq} ,1h, dB	24	19	17	14	14	16	18	19	20	21	21

17.02.2026

Dessutom får buller under natten som eventuellt orsakar sömnstörningar och som tydligt skiljer sig från bakgrundsbuller inte överskrida 25 dB som medelljudnivå under en timme LAeq,1h uppmätt i sovutrymmen.

1.3.2 Skuggeffekter

I Finland finns inga allmänna myndighetsbestämmelser om den maximala varaktigheten för skuggning som orsakas av vindkraftverk eller bedömningsgrunder för skuggbildning. I miljöministeriets (2016) anvisningar för planering av vindkraftbyggande föreslås att man använder andra länders rekommendationer om begränsning av skuggeffekter.

I flera länder har det utfärdats riktvärden eller getts rekommendationer för den godkända mängden av skuggeffekter. I till exempel Danmark tillämpas vanligtvis högst tio timmar per år som gränsvärde i en verklig situation. I Sverige är motsvarande rekommendation åtta timmar per år och 30 minuter per dag. I Finland har inga egna rekommendationer eller gränsvärden fastställts för skuggeffekter.

Vid bedömningen granskades konsekvenserna i ett område där skuggor eller skuggeffekter i en verklig situation enligt modelleringen ("Real Case") förekommer under minst 8 timmar per år.

17.02.2026

2 Resultat av buller- och skuggningsmodelleringarna

2.1 Buller

2.1.1 Projektalternativ ALT1: Beräkningsresultat för buller (ISO 9613-2)

På bild 1 presenteras bullermodelleringens resultat i alternativ 1. Den lila kurvan anger gränsen för bullerområdet 40 dB, som också är ett riktvärde för boende och fritidsboende (1107/2015). Som beräkningspunkter valdes bostads- och fritidsbyggnader i närheten av kraftverksområdet. De ljudnivåer som beräknats för beräkningspunkternas gårdsplaner presenteras i tabell 9.

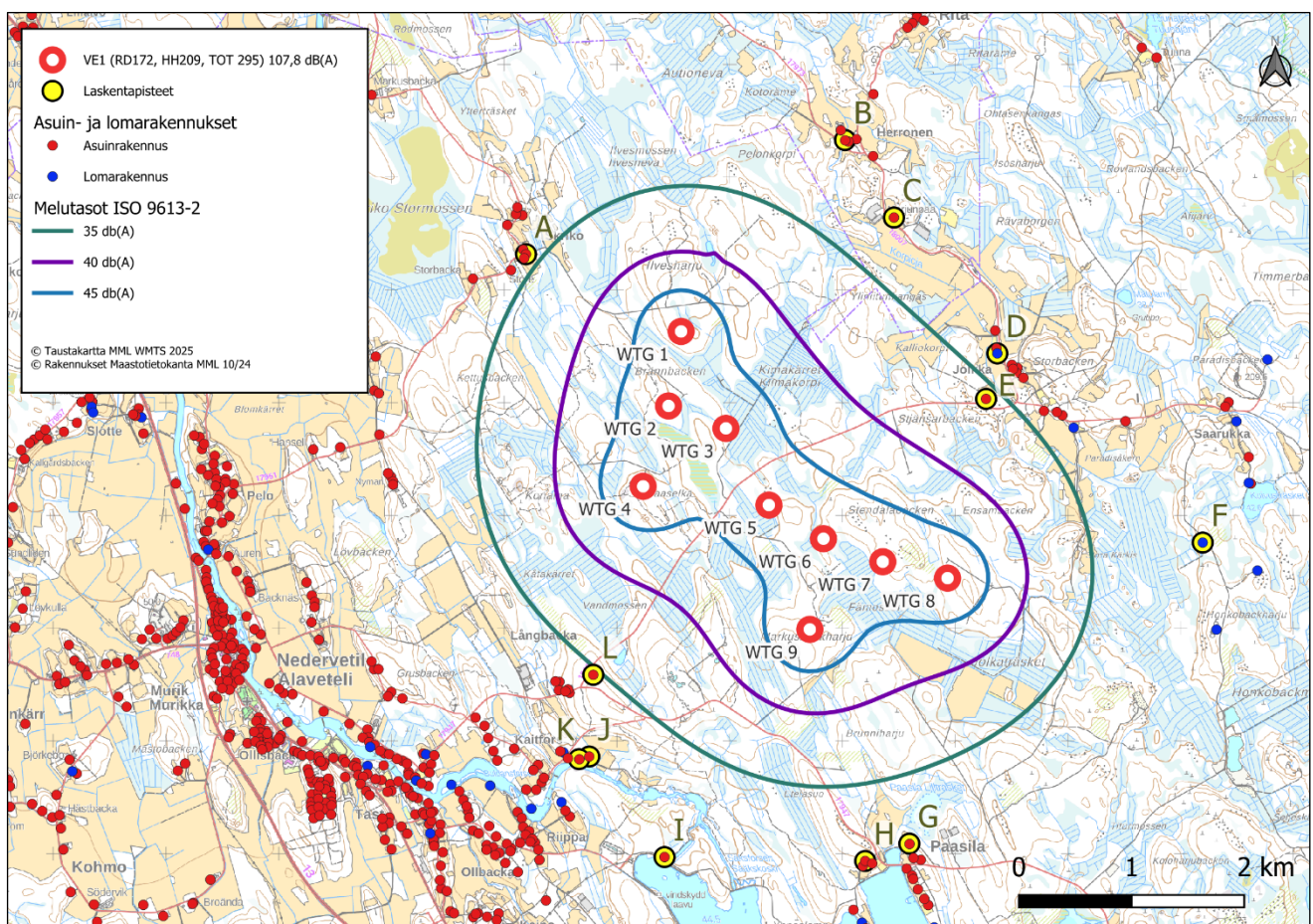


Bild 1 Bullermodelleringens resultat i alternativ ALT1.

Enligt den sammantagna modelleringens resultat för projektalternativ 1 överskrider inte en bullernivå på 40 dB(A) vid de närmaste bostads- och fritidsbyggnaderna (Bild 1, Tabell 9). Se noggrannare beräkningsresultat i bilaga 1.

17.02.2026

Tabell 9. Kalkylerade bullernivåer som orsakas av vindkraftsproduktionen i omgivningen av vindkraftverken i alternativ 1.

Beräkningspunkt	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk- ningshöjd (m)	Bullernivå dB(A)
A - Bostadsbyggnad	321194	7073316	32	4	34,2
B - Bostadsbyggnad	324024	7074328	24,7	4	31
C - Bostadsbyggnad	324459	7073641	29,1	4	32,5
D - Fritidsbyggnad	325375	7072435	30	4	33,8
E - Bostadsbyggnad	325275	7072032	32,5	4	35,6
F - Fritidsbyggnad	327197	7070758	47,1	4	29,9
G - Bostadsbyggnad	324595	7068088	51,4	4	31,9
H - Bostadsbyggnad	324203	7067934	55,2	4	31,5
I - Bostadsbyggnad	322423	7067969	42,5	4	30,4
J - Bostadsbyggnad	321755	7068860	35	4	32,1
K - Bostadsbyggnad	321664	7068837	33,5	4	31,7
L - Bostadsbyggnad	321791	7069585	50	4	34,7

2.1.2 Projektalternativ ALT2: Beräkningsresultat för buller (ISO 9613-2)

På bild 2 presenteras bullermodelleringens resultat i alternativ 2. Den lila kurvan anger gränsen för bullerområdet 40 dB, som också är ett riktvärde för boende och fritidsboende (1107/2015). Som beräkningspunkter valdes bostads- och fritidsbyggnader i närheten av kraftverken. De ljudnivåer som beräknats för beräkningspunkternas gårdsplaner presenteras i tabell 10.

17.02.2026

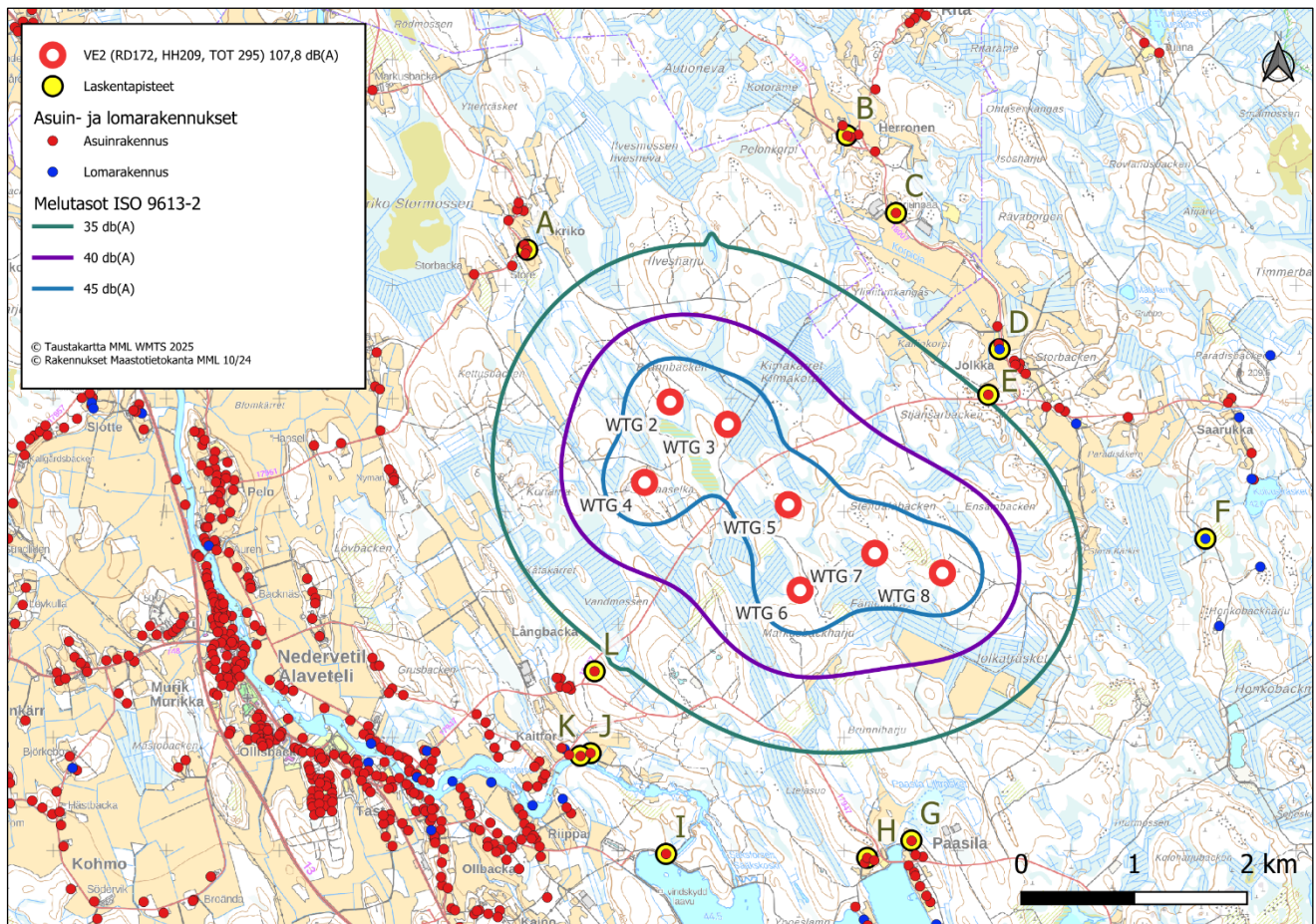


Bild 2 Bullermodelleringens resultat i alternativ ALT2.

Enligt den sammantagna modelleringens resultat för projekialternativ 2 överskrider inte en bullernivå på 40 dB(A) vid de närmaste bostads- och fritidsbyggnaderna (Bild 2, Tabell 10). Se noggrannare beräkningsresultat i bilaga 2.

17.02.2026

Tabell 10. Kalkylerade bullernivåer som orsakas av vindkraftsproduktionen i omgivningen av vindkraftverken i alternativ 2.

Beräkningspunkt	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk- ningshöjd (m)	Bullernivå dB(A)
A - Bostadsbyggnad	321194	7073316	32	4	31,9
B - Bostadsbyggnad	324024	7074328	24,7	4	29,1
C - Bostadsbyggnad	324459	7073641	29,1	4	31
D - Fritidsbyggnad	325375	7072435	30	4	32,9
E - Bostadsbyggnad	325275	7072032	32,5	4	34,8
F - Fritidsbyggnad	327197	7070758	47,1	4	29
G - Bostadsbyggnad	324595	7068088	51,4	4	30,7
H - Bostadsbyggnad	324203	7067934	55,2	4	30,2
I - Bostadsbyggnad	322423	7067969	42,5	4	29,3
J - Bostadsbyggnad	321755	7068860	35	4	31,2
K - Bostadsbyggnad	321664	7068837	33,5	4	30,9
L - Bostadsbyggnad	321791	7069585	50	4	34

2.1.3 Lågfrekventa bullernivåer

De kalkylerade resultaten för byggnaderna inomhus har jämförts med åtgärdsgränser som anges i Social- och hälsovårdsministeriets förordning om boendehälsa (545/2015) som berör de högsta nivåerna av buller nat-tetid i utrymmen som avsedda att sova i.

De kalkylerade resultaten har fåtts genom att beakta närmevärdet för ytterhöljet till finländska småhus (84 % percentil, Anojanssi 2018). Det finns emellertid stora individuella variationer i byggnaders ljudisolering, särskilt på låga frekvenser. Bullernivån inomhus påverkas dessutom betydligt att rummets mått och inredning, vilket ökar osäkerhetsfaktorerna i bedömningen.

Enligt modelleringen överskrider det lågfrekventa bullret inte heller Social- och hälsovårdsministeriets rikt-värde för boendehälsa inomhus vid beräkningspunkterna A–K i något av alternativen. I alternativ 1 är bullret i byggnadernas inomhusutrymmen som högst 8,0 dB under åtgärdsgränsen med frekvensen 50 Hz (Bostadsbyggnad E). I alternativ 2 är bullret i byggnadernas inomhusutrymmen som högst 8,9 dB under åtgärdsgrän-sen med frekvensen 50 Hz (Bostadsbyggnad E).

Resultaten presenteras i tabell 11 och 12 som beskriver hur den lågfrekventa bullernivån avviker från åtgärdsgränserna i social- och hälsovårdsministeriets förordning om boendehälsa. Ett negativt värde innebär att åtgärdsgränsen underskrids och ett positivt värde att det överskrids.

Mer detaljerade beräkningsresultat för lågfrekvent buller vid olika byggnader presenteras i bilaga 3 och 4.

17.02.2026

Tabell 11. Beräkningsresultat för lågfrekvent buller i alternativ 1.

Beräkningspunkt	Ljudnivå utomhus		Ljudnivå inomhus	
	L eq,1h – Förordningen om boendehälsa inomhus	Hz	L eq,1h – Förordningen om boendehälsa inomhus	Hz
A - Bostadsbyggnad	3,7	100	-9,3	50
B - Bostadsbyggnad	1,5	63	-11,3	50
C - Bostadsbyggnad	2,7	100	-10,2	50
D - Fritidsbyggnad	3,7	100	-9,2	50
E - Bostadsbyggnad	5,0	100	-8,0	50
F - Fritidsbyggnad	0,6	63	-12,3	50
G - Bostadsbyggnad	2,1	63	-10,8	50
H - Bostadsbyggnad	1,8	63	-11,1	50
I - Bostadsbyggnad	1,1	63	-11,8	50
J - Bostadsbyggnad	2,3	63	-10,5	50
K - Bostadsbyggnad	2,1	63	-10,8	50
L - Bostadsbyggnad	4,3	100	-8,7	50

Tabell 12. Beräkningsresultat för lågfrekvent buller i alternativ 2.

Beräkningspunkt	Ljudnivå utomhus		Ljudnivå inomhus	
	L eq,1h – Förordningen om boendehälsa inomhus	Hz	L eq,1h – Förordningen om boendehälsa inomhus	Hz
A - Bostadsbyggnad	1,8	100	-11,1	50
B - Bostadsbyggnad	0,0	63	-12,9	50
C - Bostadsbyggnad	1,3	63	-11,6	50
D - Fritidsbyggnad	2,7	100	-10,2	50
E - Bostadsbyggnad	4,1	100	-8,9	50
F - Fritidsbyggnad	-0,3	63	-13,2	50
G - Bostadsbyggnad	0,9	63	-11,9	50
H - Bostadsbyggnad	0,7	63	-12,2	50
I - Bostadsbyggnad	0,1	63	-12,8	50
J - Bostadsbyggnad	1,4	100	-11,5	50
K - Bostadsbyggnad	1,2	63	-11,7	50
L - Bostadsbyggnad	3,5	100	-9,5	50

17.02.2026

2.2 Skuggeffekter

I modelleringarna av skuggeffekter för Jolkkaprojektet användes ett kraftverk med en rotordiameter på 200 meter och en navhöjd på 195 meter. Modelleringarna har gjorts för båda projekialternativen samt utan skymmande effekt från träd och med skymmande effekt från träd.

ALT1

I alternativ 1 uppstår över 8 timmar skuggeffekter vid en beräkningspunkt (beräkningspunkt E) på gårdsplanerna till de närmaste bostads- och fritidsbyggnaderna när den skymmande effekten från träd inte har beaktats. Vid bostadsbyggnad E uppgår skuggeffekterna till 8 timmar 22 minuter per år. Resultaten presenteras i tabell 13 och på bild 3. Mer detaljerade beräkningsresultat presenteras i bilaga 5.

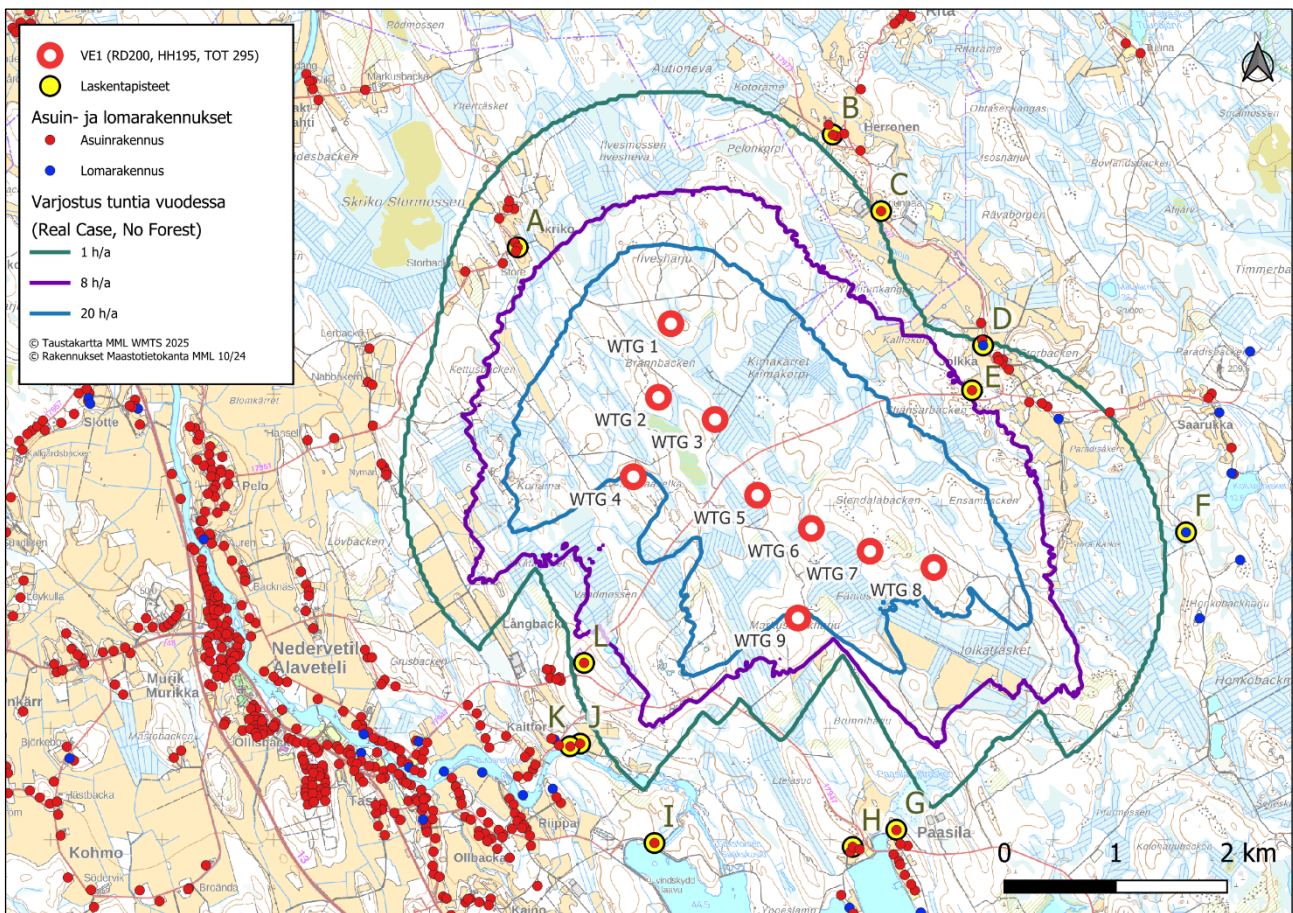


Bild 3. Resultaten av skuggmodelleringen utan skymmande effekt från träd i alternativ 1.

17.02.2026

Tabell 13. Bullermodelleringens resultat i alternativ 1 när den skymmande effekten från träd inte beaktas "real case, no forest".

Beräkningspunkt	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk- nings- fönster (m)	Skuggef- fekter (h/a)
A - Bostadsbyggnad	321194	7073316	32	5,0 x 5,0	5:04
B - Bostadsbyggnad	324024	7074328	24,7	5,0 x 5,0	0:00
C - Bostadsbyggnad	324459	7073641	29,1	5,0 x 5,0	0:00
D - Fritidsbyggnad	325375	7072435	30	5,0 x 5,0	2:19
E - Bostadsbyggnad	325275	7072032	32,5	5,0 x 5,0	8:22
F - Fritidsbyggnad	327197	7070758	47,1	5,0 x 5,0	0:00
G - Bostadsbyggnad	324595	7068088	51,4	5,0 x 5,0	0:00
H - Bostadsbyggnad	324203	7067934	55,2	5,0 x 5,0	0:00
I - Bostadsbyggnad	322423	7067969	42,5	5,0 x 5,0	0:00
J - Bostadsbyggnad	321755	7068860	35	5,0 x 5,0	0:00
K - Bostadsbyggnad	321664	7068837	33,5	5,0 x 5,0	0:00
L - Bostadsbyggnad	321791	7069585	50	5,0 x 5,0	2:01

I alternativ 1 överskrids 8 timmars skuggeffekter per år inte på enda på gårdsplan till de närmaste bostads- och fritidsbyggnaderna när den skymmande effekten från träd har beaktats. Resultaten presenteras i tabell 14 och på bild 4. Mer detaljerade beräkningsresultat presenteras i bilaga 6.

17.02.2026

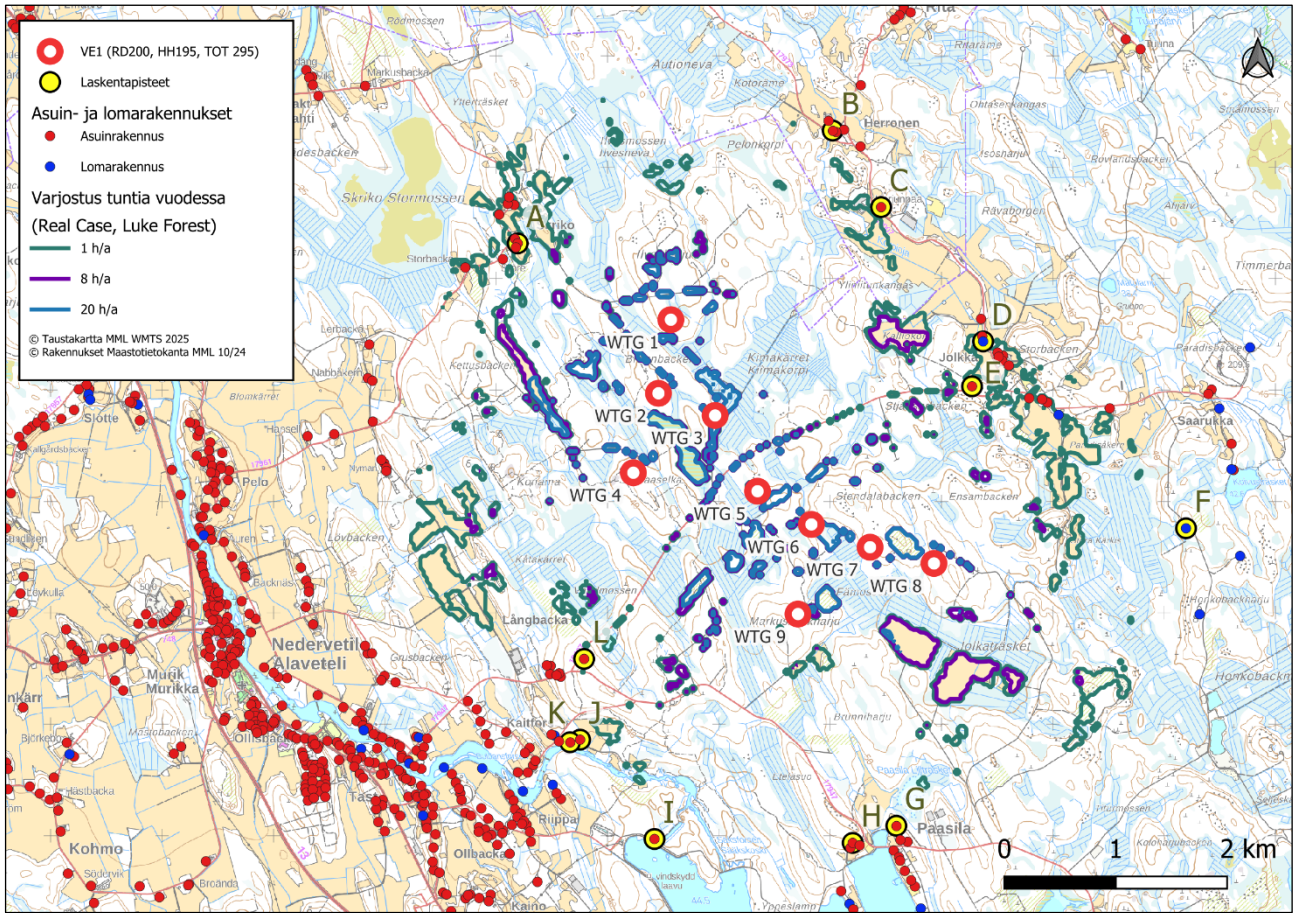


Bild 4. Skuggmodelleringens resultat i alternativ 1 (när den skyddande effekten från träd beaktas).

Tabell 14. Skuggmodelleringens resultat i alternativ 1 när den skymmande effekten från träd har beaktas "real case, luke forest".

Beräkningspunkt	ETRS89-TM35 Ost	ETRS89-TM35 Norr	Z (m)	Beräkningsfönster (m)	Skuggefekter (h/a)
A - Bostadsbyggnad	321194	7073316	32	5,0 x 5,0	5:04
B - Bostadsbyggnad	324024	7074328	24,7	5,0 x 5,0	0:00
C - Bostadsbyggnad	324459	7073641	29,1	5,0 x 5,0	0:00
D - Fritidsbyggnad	325375	7072435	30	5,0 x 5,0	2:19
E - Bostadsbyggnad	325275	7072032	32,5	5,0 x 5,0	5:02
F - Fritidsbyggnad	327197	7070758	47,1	5,0 x 5,0	0:00
G - Bostadsbyggnad	324595	7068088	51,4	5,0 x 5,0	0:00
H - Bostadsbyggnad	324203	7067934	55,2	5,0 x 5,0	0:00
I - Bostadsbyggnad	322423	7067969	42,5	5,0 x 5,0	0:00
J - Bostadsbyggnad	321755	7068860	35	5,0 x 5,0	0:00
K - Bostadsbyggnad	321664	7068837	33,5	5,0 x 5,0	0:00
L - Bostadsbyggnad	321791	7069585	50	5,0 x 5,0	2:01

17.02.2026

Tabell 15. Bullermodelleringens resultat i alternativ 2 när den skymmande effekten från träd inte beaktas "real case, no forest".

Beräkningspunkt	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk- nings- fönster (m)	Skuggef- fekter (h/a)
A - Bostadsbyggnad	321194	7073316	32	5,0 x 5,0	2:20
B - Bostadsbyggnad	324024	7074328	24,7	5,0 x 5,0	0:00
C - Bostadsbyggnad	324459	7073641	29,1	5,0 x 5,0	0:00
D - Fritidsbyggnad	325375	7072435	30	5,0 x 5,0	2:17
E - Bostadsbyggnad	325275	7072032	32,5	5,0 x 5,0	7:51
F - Fritidsbyggnad	327197	7070758	47,1	5,0 x 5,0	0:00
G - Bostadsbyggnad	324595	7068088	51,4	5,0 x 5,0	0:00
H - Bostadsbyggnad	324203	7067934	55,2	5,0 x 5,0	0:00
I - Bostadsbyggnad	322423	7067969	42,5	5,0 x 5,0	0:00
J - Bostadsbyggnad	321755	7068860	35	5,0 x 5,0	0:00
K - Bostadsbyggnad	321664	7068837	33,5	5,0 x 5,0	0:00
L - Bostadsbyggnad	321791	7069585	50	5,0 x 5,0	2:44

I alternativ 2 överskrids 8 timmars skuggeffekter per år inte vid enda på gårdsplan till de närmaste bostads- och fritidsbyggnaderna när den skymmande effekten från träd har beaktats. Resultaten presenteras i tabell 16 och på bild 6. Mer detaljerade beräkningsresultat presenteras i bilaga 8.

17.02.2026

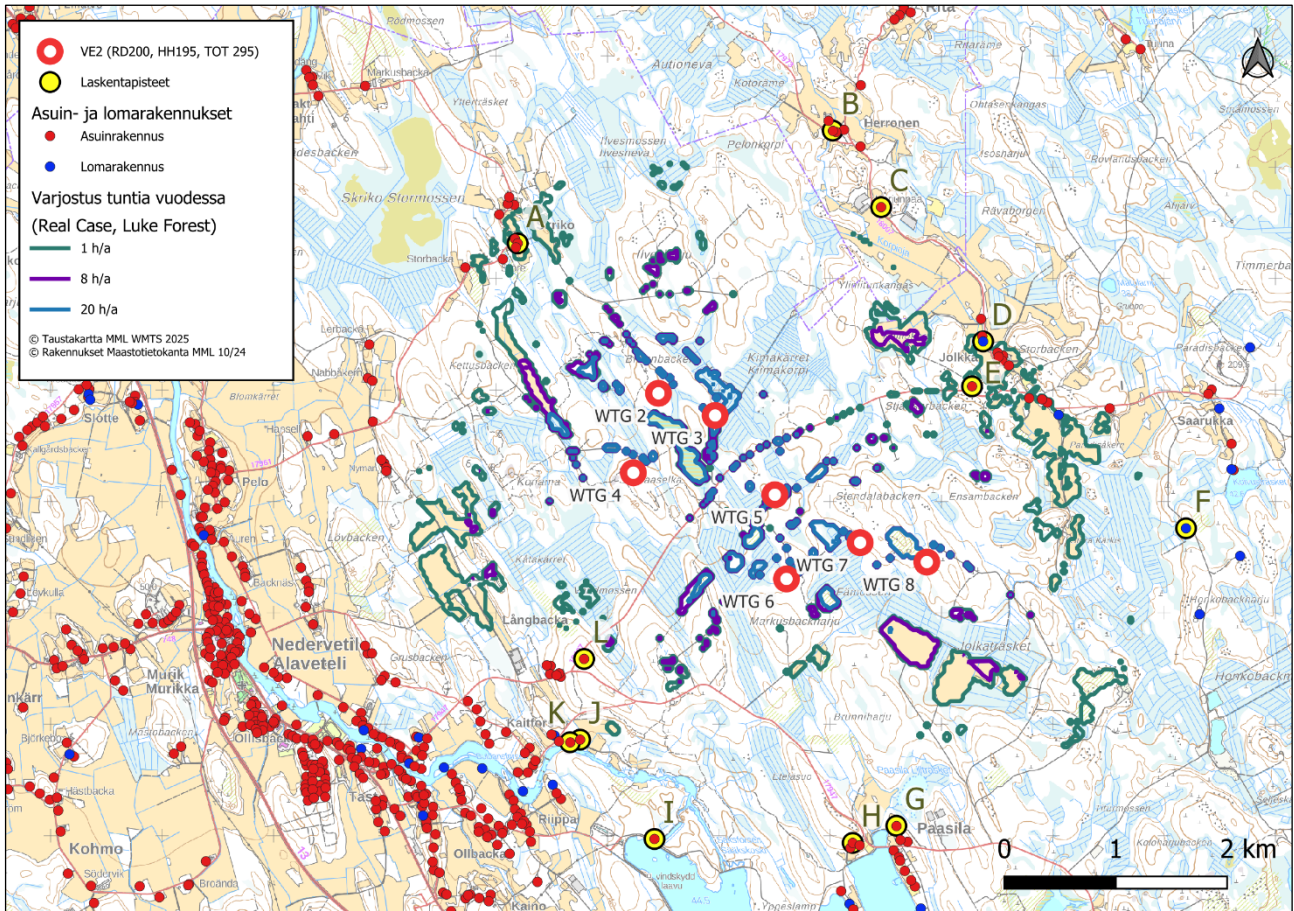


Bild 6. Skuggmodelleringens resultat i alternativ 2 (när den skyddande effekten från träd beaktas).

17.02.2026

Tabell 16. Skuggmodelleringens resultat i alternativ 2 när den skymmande effekten från träd har beaktas "real case, luke forest".

Beräkningspunkt	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk- nings- fönster (m)	Skuggef- fekter (h/a)
A - Bostadsbyggnad	321194	7073316	32	5,0 x 5,0	2:20
B - Bostadsbyggnad	324024	7074328	24,7	5,0 x 5,0	0:00
C - Bostadsbyggnad	324459	7073641	29,1	5,0 x 5,0	0:00
D - Fritidsbyggnad	325375	7072435	30	5,0 x 5,0	2:17
E - Bostadsbyggnad	325275	7072032	32,5	5,0 x 5,0	4:34
F - Fritidsbyggnad	327197	7070758	47,1	5,0 x 5,0	0:00
G - Bostadsbyggnad	324595	7068088	51,4	5,0 x 5,0	0:00
H - Bostadsbyggnad	324203	7067934	55,2	5,0 x 5,0	0:00
I - Bostadsbyggnad	322423	7067969	42,5	5,0 x 5,0	0:00
J - Bostadsbyggnad	321755	7068860	35	5,0 x 5,0	0:00
K - Bostadsbyggnad	321664	7068837	33,5	5,0 x 5,0	0:00
L - Bostadsbyggnad	321791	7069585	50	5,0 x 5,0	0:00

17.02.2026

3 Resultat av modellering av sammantaget buller och sammantagna skuggeffekter

3.1 Buller

3.1.1 Projektalternativ ALT1: Beräkningsresultat för sammantaget buller

På bild 7 presenteras resultaten av modelleringen av sammantaget buller i alternativ 1. Den lila kurvan anger gränsen för bullerområdet 40 dB, som också är ett riktvärde för boende och fritidsboende (1107/2015). Som beräkningspunkter valdes bostads- och fritidsbyggnader i närheten av kraftverksområdet. De ljudnivåer som beräknats för beräkningspunkternas gårdsplaner presenteras i tabell 17.

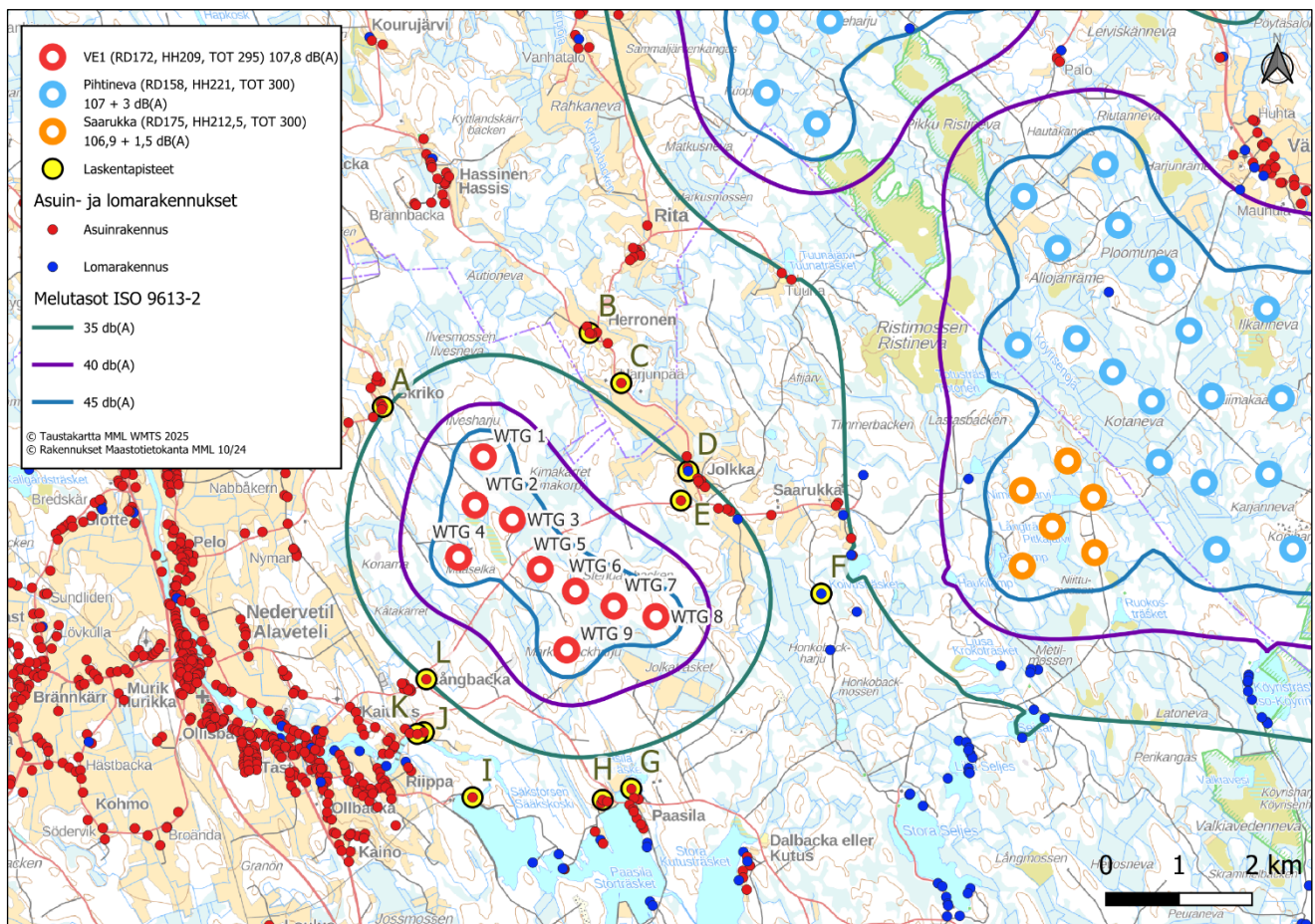


Bild 7. Resultat av modelleringen av sammantaget buller i projektalternativ 1.

Enligt modelleringen av sammantaget buller i projektalternativ 1 överskrider en bullernivå på 40 dB(A) inte vid de bostads- och fritidsbyggnader som ligger närmast Jolikka vindkraftsprojekt (Bild 7, Tabell 17). Se noggrannare beräkningsresultat i bilaga 9.

17.02.2026

Tabell 17. Kalkylerade nivåer av sammantaget buller i omgivningen av Jolkka vindkraftsprojekt i projekialternativ 1.

Beräkningspunkt	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk- ningshöjd (m)	Bullernivå dB(A)
A - Bostadsbyggnad	321194	7073316	32	4	34,6
B - Bostadsbyggnad	324024	7074328	24,7	4	33
C - Bostadsbyggnad	324459	7073641	29,1	4	34
D - Fritidsbyggnad	325375	7072435	30	4	35,1
E - Bostadsbyggnad	325275	7072032	32,5	4	36,5
F - Fritidsbyggnad	327197	7070758	47,1	4	34,1
G - Bostadsbyggnad	324595	7068088	51,4	4	32,7
H - Bostadsbyggnad	324203	7067934	55,2	4	32,3
I - Bostadsbyggnad	322423	7067969	42,5	4	31,1
J - Bostadsbyggnad	321755	7068860	35	4	32,6
K - Bostadsbyggnad	321664	7068837	33,5	4	32,3
L - Bostadsbyggnad	321791	7069585	50	4	35

3.1.2 Projekialternativ ALT2: Beräkningsresultat för sammantaget buller

På bild 8 presenteras resultaten av modelleringen av sammantaget buller i alternativ 1. Den lila kurvan anger gränsen för bullerområdet 40 dB, som också är ett riktvärde för boende och fritidsboende (1107/2015). Som beräkningspunkter valdes bostads- och fritidsbyggnader i närheten av kraftverksområdet. De ljudnivåer som beräknats för beräkningspunkternas gårdsplaner presenteras i tabell 18.

17.02.2026

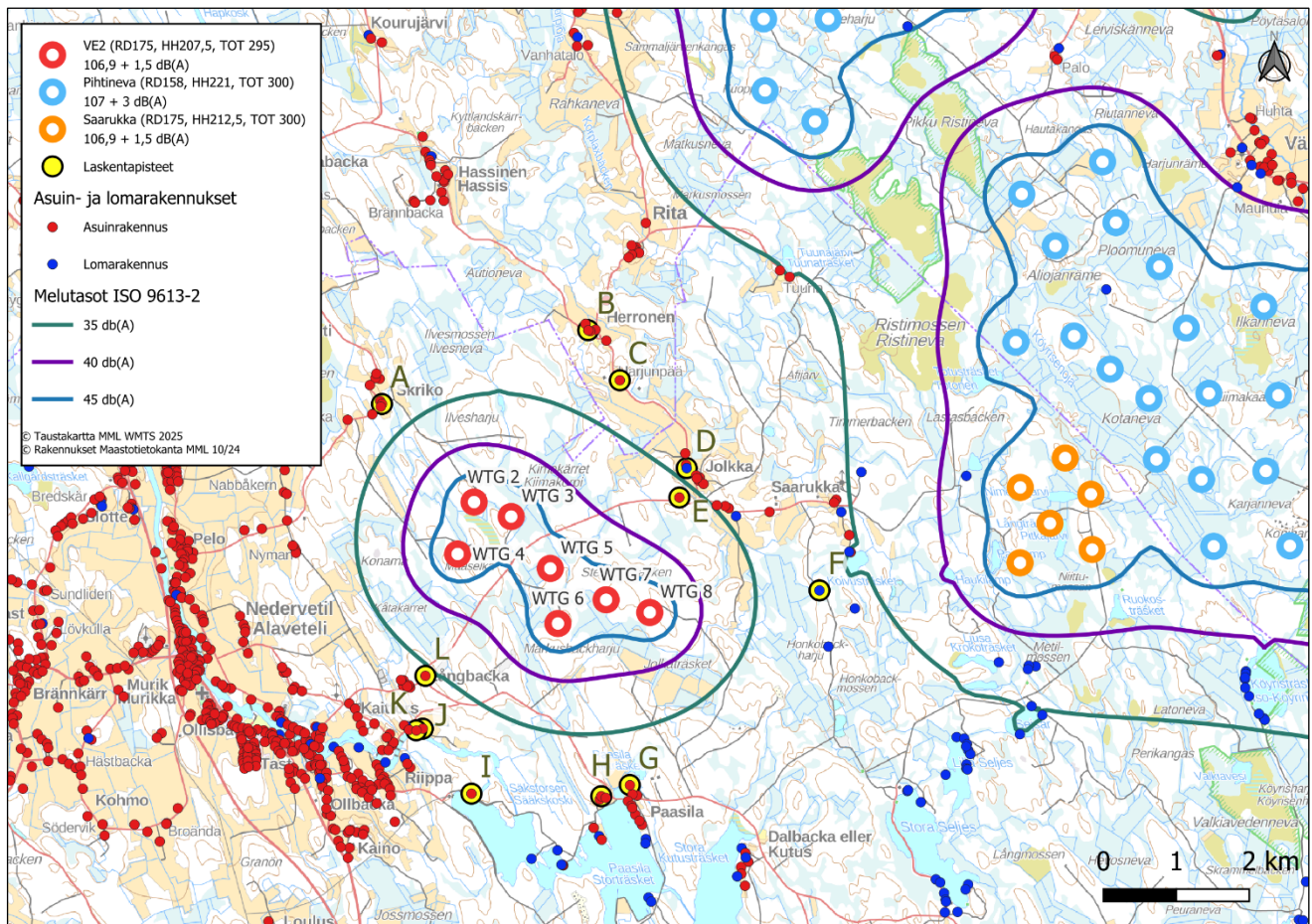


Bild 8. Resultat av modelleringen av sammantaget buller i projekialternativ 2.

Enligt modelleringen av sammantaget buller i projekialternativ 2 överskrider en bullernivå på 40 dB(A) inte vid de bostads- och fritidsbyggnader som ligger närmast Jolkka vindkraftsprojekt (Bild 8, Tabell 18). Se noggrannare beräkningsresultat i bilaga 10.

17.02.2026

Tabell 18. Kalkylerade nivåer av sammantaget buller i omgivningen av Jolkka vindkraftsprojekt i projekialternativ 2.

Beräkningspunkt	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk- ningshöjd (m)	Bullernivå dB(A)
A - Bostadsbyggnad	321194	7073316	32	4	32,7
B - Bostadsbyggnad	324024	7074328	24,7	4	31,9
C - Bostadsbyggnad	324459	7073641	29,1	4	33
D - Fritidsbyggnad	325375	7072435	30	4	34,5
E - Bostadsbyggnad	325275	7072032	32,5	4	35,8
F - Fritidsbyggnad	327197	7070758	47,1	4	33,8
G - Bostadsbyggnad	324595	7068088	51,4	4	31,7
H - Bostadsbyggnad	324203	7067934	55,2	4	31,3
I - Bostadsbyggnad	322423	7067969	42,5	4	30,2
J - Bostadsbyggnad	321755	7068860	35	4	31,8
K - Bostadsbyggnad	321664	7068837	33,5	4	31,5
L - Bostadsbyggnad	321791	7069585	50	4	34,3

3.1.3 Lågfrekventa bullernivåer

De kalkylerade resultaten för byggnaderna inomhus har jämförts med åtgärdsgränser som anges i Social- och hälsovårdsministeriets förordning om boendehälsa (545/2015) som berör de högsta nivåerna av buller nat-tetid i utrymmen som avsedda att sova i.

De kalkylerade resultaten har fåtts genom att beakta närmevärdet för ytterhöljet till finländska småhus (84 % percentil, Anojanssi 2018). Det finns emellertid stora individuella variationer i byggnaders ljudisolering, särskilt på låga frekvenser. Bullernivån inomhus påverkas dessutom betydligt av rummets mått och inredning, vilket ökar osäkerhetsfaktorerna i bedömningen.

Enligt modelleringen av sammantaget lågfrekvent buller överskrider det lågfrekventa bullret inte heller Social- och hälsovårdsministeriets riktvärde för boendehälsa inomhus vid beräkningspunkterna A–K i något av alternativen. I alternativ 1 är bullret i byggnadernas inomhusutrymmen som högst 5,2 dB under åtgärdsgränsen med frekvensen 50 Hz (Bostadsbyggnad E). I alternativ 2 är bullret i byggnadernas inomhusutrymmen som högst 5,7 dB under åtgärdsgränsen med frekvensen 50 Hz (Bostadsbyggnad E).

Resultaten presenteras i tabell 19 och 20 som beskriver hur den lågfrekventa bullernivån avviker från åtgärdsgränserna i social- och hälsovårdsministeriets förordning om boendehälsa. Ett negativt värde innebär att åtgärdsgränsen underskrids och ett positivt värde att det överskrids.

Mer detaljerade beräkningsresultat för lågfrekvent buller vid olika byggnader presenteras i bilaga 11 och 12.

17.02.2026

Tabell 19. Beräkningsresultat för sammantaget lågfrekvent buller i alternativ 1.

Beräkningspunkt	Ljudnivå utomhus		Ljudnivå inomhus	
	L eq,1h – Anvisningar om boendehälsa inomhus	Hz	L eq,1h – Anvisningar om boendehälsa inomhus	Hz
A - Bostadsbyggnad	5,2	63	-7,3	50
B - Bostadsbyggnad	5,4	63	-6,8	50
C - Bostadsbyggnad	6,0	63	-6,3	50
D - Fritidsbyggnad	6,7	63	-5,7	50
E - Bostadsbyggnad	7,2	63	-5,2	50
F - Fritidsbyggnad	6,4	63	-5,9	50
G - Bostadsbyggnad	4,4	63	-8,0	50
H - Bostadsbyggnad	4,1	63	-8,3	50
I - Bostadsbyggnad	3,2	63	-9,1	50
J - Bostadsbyggnad	4,0	63	-8,4	50
K - Bostadsbyggnad	3,8	63	-8,6	50
L - Bostadsbyggnad	5,4	63	-7,1	50

Tabell 20. Beräkningsresultat för sammantaget lågfrekvent buller i alternativ 2.

Beräkningspunkt	Ljudnivå utomhus		Ljudnivå inomhus	
	L eq,1h – Anvisningar om boendehälsa inomhus	Hz	L eq,1h – Anvisningar om boendehälsa inomhus	Hz
A - Bostadsbyggnad	4,0	63	-8,3	50
B - Bostadsbyggnad	4,8	63	-7,3	50
C - Bostadsbyggnad	5,4	63	-6,8	50
D - Fritidsbyggnad	6,2	63	-6,1	50
E - Bostadsbyggnad	6,7	63	-5,7	50
F - Fritidsbyggnad	6,2	63	-6,1	50
G - Bostadsbyggnad	3,8	63	-8,5	50
H - Bostadsbyggnad	3,5	63	-8,8	50
I - Bostadsbyggnad	2,6	63	-9,7	50
J - Bostadsbyggnad	3,4	63	-9,0	50
K - Bostadsbyggnad	3,2	63	-9,1	50
L - Bostadsbyggnad	4,8	63	-7,7	50

17.02.2026

3.2 Skuggeffekter

Modelleringarna av sammantagna skuggeffekter har gjorts för båda projekialternativen samt utan skymmande effekt från träd och med skymmande effekt från träd.

ALT1

I modelleringarna av sammantagna skuggeffekter i projekialternativ 1 överskrider skuggeffekterna 8 timmar per år på gårdsplanen till en beräkningspunkt (beräkningspunkt E) när den skymmande effekten från träd inte har beaktats. Resultaten presenteras i tabell 21 och på bild 9. Mer detaljerade beräkningsresultat presenteras i bilaga 13.

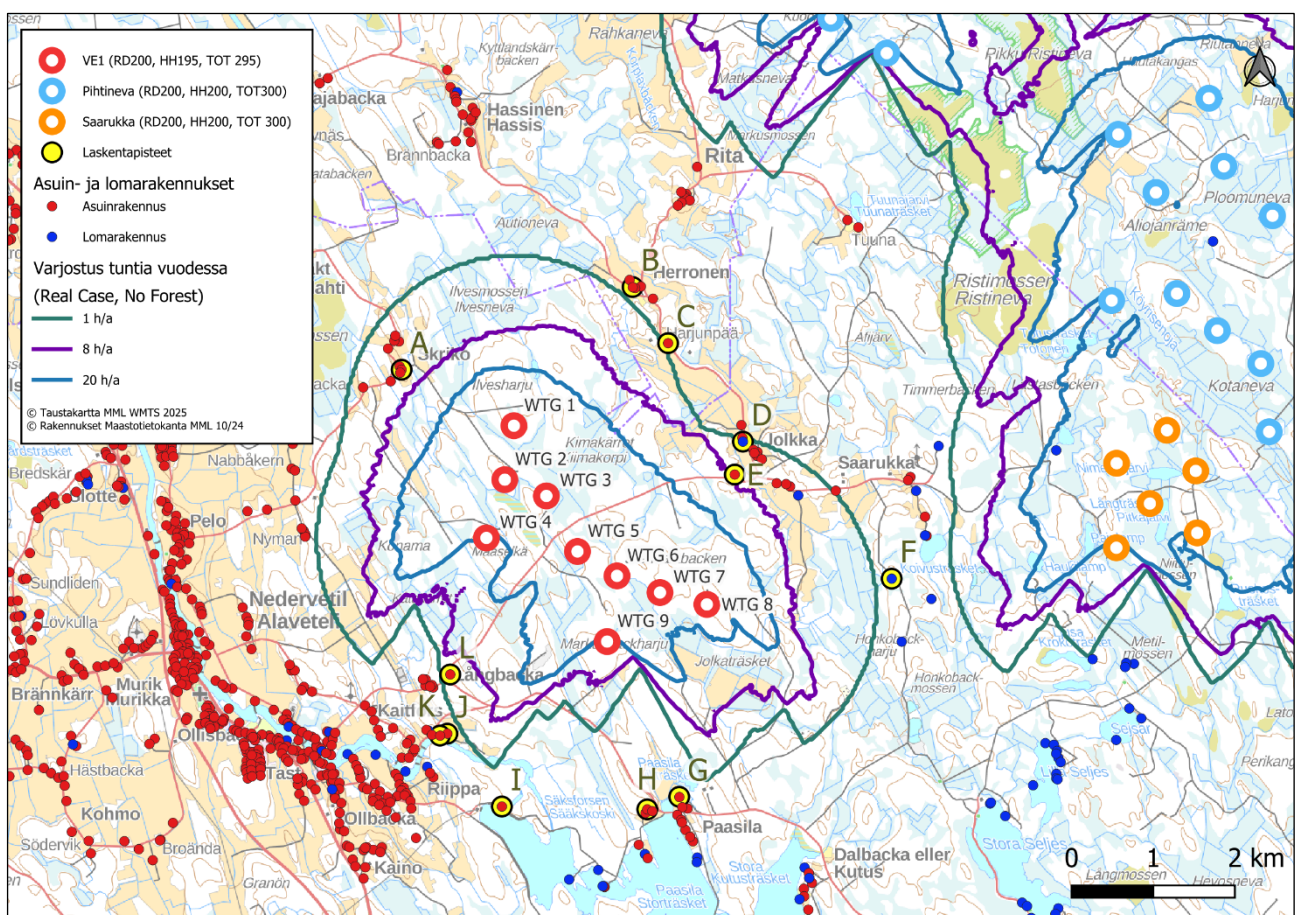


Bild 9. Resultat av modelleringen av sammantagna skuggeffekter i projekialternativ 1 (den skyddande effekten från träd har inte beaktats)

17.02.2026

Tabell 21. Resultat av modelleringen av sammantagna skuggeffekter i alternativ 1 när den skyddande effekten från träd inte har beaktats "Real Case, No Forest".

Beräkningspunkt	ETRS89-TM35 Ost	ETRS89-TM35 Norr	Z (m)	Beräkningsfönster (m)	Skuggeffekter (h/a)
A - Bostadsbyggnad	321194	7073316	32	5,0 x 5,0	5:04
B - Bostadsbyggnad	324024	7074328	24,7	5,0 x 5,0	0:00
C - Bostadsbyggnad	324459	7073641	29,1	5,0 x 5,0	0:00
D - Fritidsbyggnad	325375	7072435	30	5,0 x 5,0	2:19
E - Bostadsbyggnad	325275	7072032	32,5	5,0 x 5,0	8:22
F - Fritidsbyggnad	327197	7070758	47,1	5,0 x 5,0	0:00
G - Bostadsbyggnad	324595	7068088	51,4	5,0 x 5,0	0:00
H - Bostadsbyggnad	324203	7067934	55,2	5,0 x 5,0	0:00
I - Bostadsbyggnad	322423	7067969	42,5	5,0 x 5,0	0:00
J - Bostadsbyggnad	321755	7068860	35	5,0 x 5,0	0:00
K - Bostadsbyggnad	321664	7068837	33,5	5,0 x 5,0	0:00
L - Bostadsbyggnad	321791	7069585	50	5,0 x 5,0	2:01

I alternativ 1 överskrider 8 timmars skuggeffekter per år inte vid enda på gårdsplan till de närmaste bostads- och fritidsbyggnaderna vid modelleringen av sammantagna skuggeffekter, när den skymmande effekten från träd har beaktats. Resultaten presenteras i tabell 22 och på bild 10. Mer detaljerade beräkningsresultat presenteras i bilaga 14.

17.02.2026

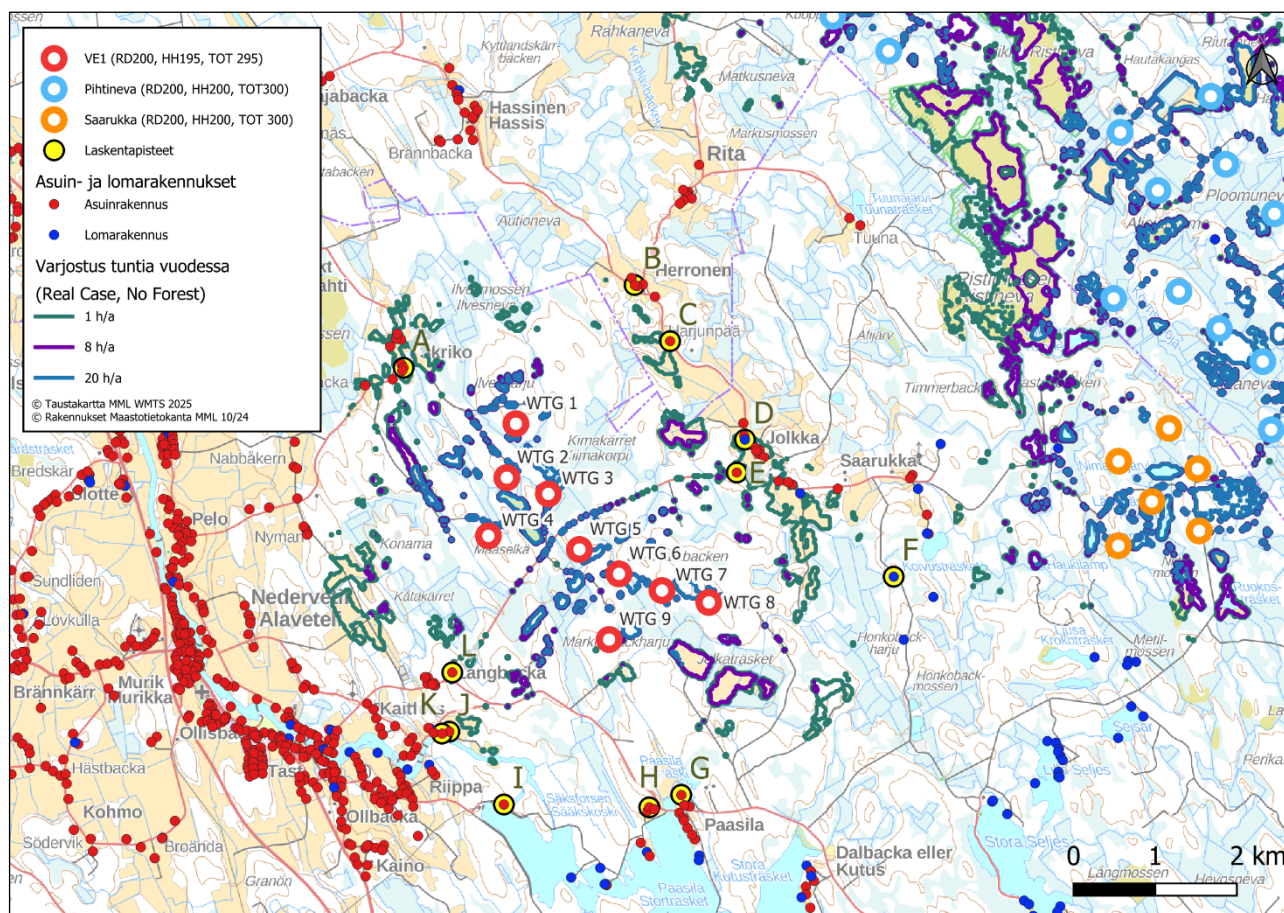


Bild 10. Resultat av modelleringen av sammantagna skuggeffekter i projekteralternativ 1 (den skyddande effekten från träd har beaktats).

Tabell 22. Resultat av modelleringen av sammantagna skuggeffekter i alternativ 1 när den skyddande effekten från träd har beaktats "Real Case, Luke Forest".

Beräkningspunkt	ETRS89-TM35 Öst	ETRS89-TM35 Norr	Z (m)	Beräk-nings-fönster (m)	Skuggef-fekter (h/a)
A - Bostadsbyggnad	321194	7073316	32	5,0 x 5,0	5:04
B - Bostadsbyggnad	324024	7074328	24,7	5,0 x 5,0	0:00
C - Bostadsbyggnad	324459	7073641	29,1	5,0 x 5,0	0:00
D - Fritidsbyggnad	325375	7072435	30	5,0 x 5,0	2:19
E - Bostadsbyggnad	325275	7072032	32,5	5,0 x 5,0	5:02
F - Fritidsbyggnad	327197	7070758	47,1	5,0 x 5,0	0:00
G - Bostadsbyggnad	324595	7068088	51,4	5,0 x 5,0	0:00
H - Bostadsbyggnad	324203	7067934	55,2	5,0 x 5,0	0:00
I - Bostadsbyggnad	322423	7067969	42,5	5,0 x 5,0	0:00
J - Bostadsbyggnad	321755	7068860	35	5,0 x 5,0	0:00
K - Bostadsbyggnad	321664	7068837	33,5	5,0 x 5,0	0:00
L - Bostadsbyggnad	321791	7069585	50	5,0 x 5,0	2:01

17.02.2026

ALT2

I alternativ 2 överskrider 8 timmars skuggeffekter per år inte vid enda på gårdsplan till de närmaste bostads- och fritidsbyggnaderna vid modelleringen av sammantagna skuggeffekter, när den skymmande effekten från träd inte har beaktats. Resultaten presenteras i tabell 23 och på bild 11. Mer detaljerade beräkningsresultat presenteras i bilaga 15.

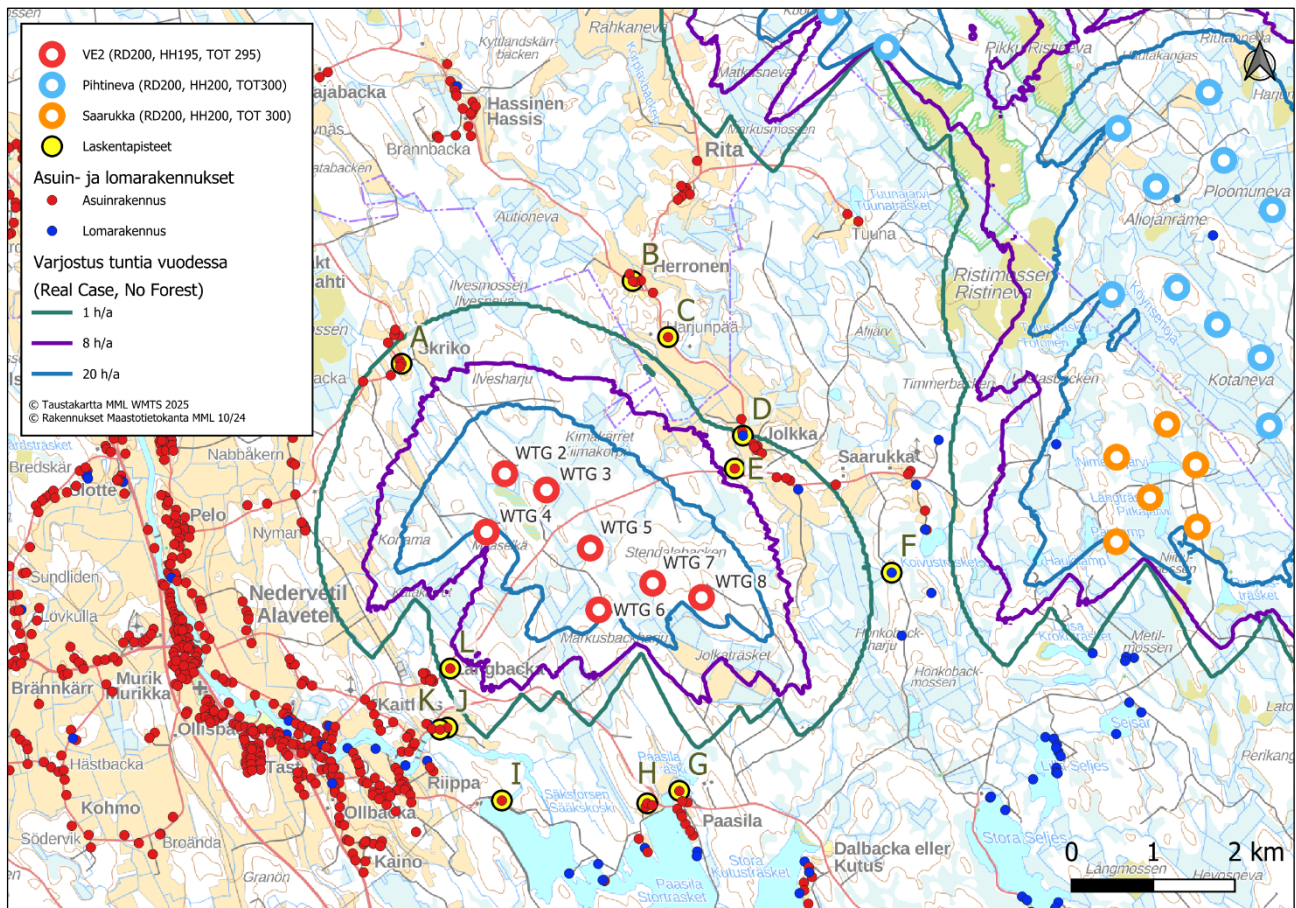


Bild 11. Resultat av modelleringen av sammantagna skuggeffekter i projekialternativ 2 (den skyddande effekten från träd har inte beaktats)

17.02.2026

Tabell 23. Resultat av modelleringen av sammantagna skuggeffekter i alternativ 2 när den skyddande effekten från träd inte har beaktats "Real Case, No Forest".

Beräkningspunkt	ETRS89-TM35 Ost	ETRS89-TM35 Norr	Z (m)	Beräkningsfönster (m)	Skuggeffekter (h/a)
A - Bostadsbyggnad	321194	7073316	32	5,0 x 5,0	2:20
B - Bostadsbyggnad	324024	7074328	24,7	5,0 x 5,0	0:00
C - Bostadsbyggnad	324459	7073641	29,1	5,0 x 5,0	0:00
D - Fritidsbyggnad	325375	7072435	30	5,0 x 5,0	2:17
E - Bostadsbyggnad	325275	7072032	32,5	5,0 x 5,0	7:51
F - Fritidsbyggnad	327197	7070758	47,1	5,0 x 5,0	0:00
G - Bostadsbyggnad	324595	7068088	51,4	5,0 x 5,0	0:00
H - Bostadsbyggnad	324203	7067934	55,2	5,0 x 5,0	0:00
I - Bostadsbyggnad	322423	7067969	42,5	5,0 x 5,0	0:00
J - Bostadsbyggnad	321755	7068860	35	5,0 x 5,0	0:00
K - Bostadsbyggnad	321664	7068837	33,5	5,0 x 5,0	0:00
L - Bostadsbyggnad	321791	7069585	50	5,0 x 5,0	2:44

I alternativ 2 överskrider 8 timmars skuggeffekter per år inte vid enda på gårdsplan till de närmaste bostads- och fritidsbyggnaderna vid modelleringen av sammantagna skuggeffekter, när den skymmande effekten från träd har beaktats. Resultaten presenteras i tabell 24 och på bild 12. Mer detaljerade beräkningsresultat presenteras i bilaga 16.

17.02.2026

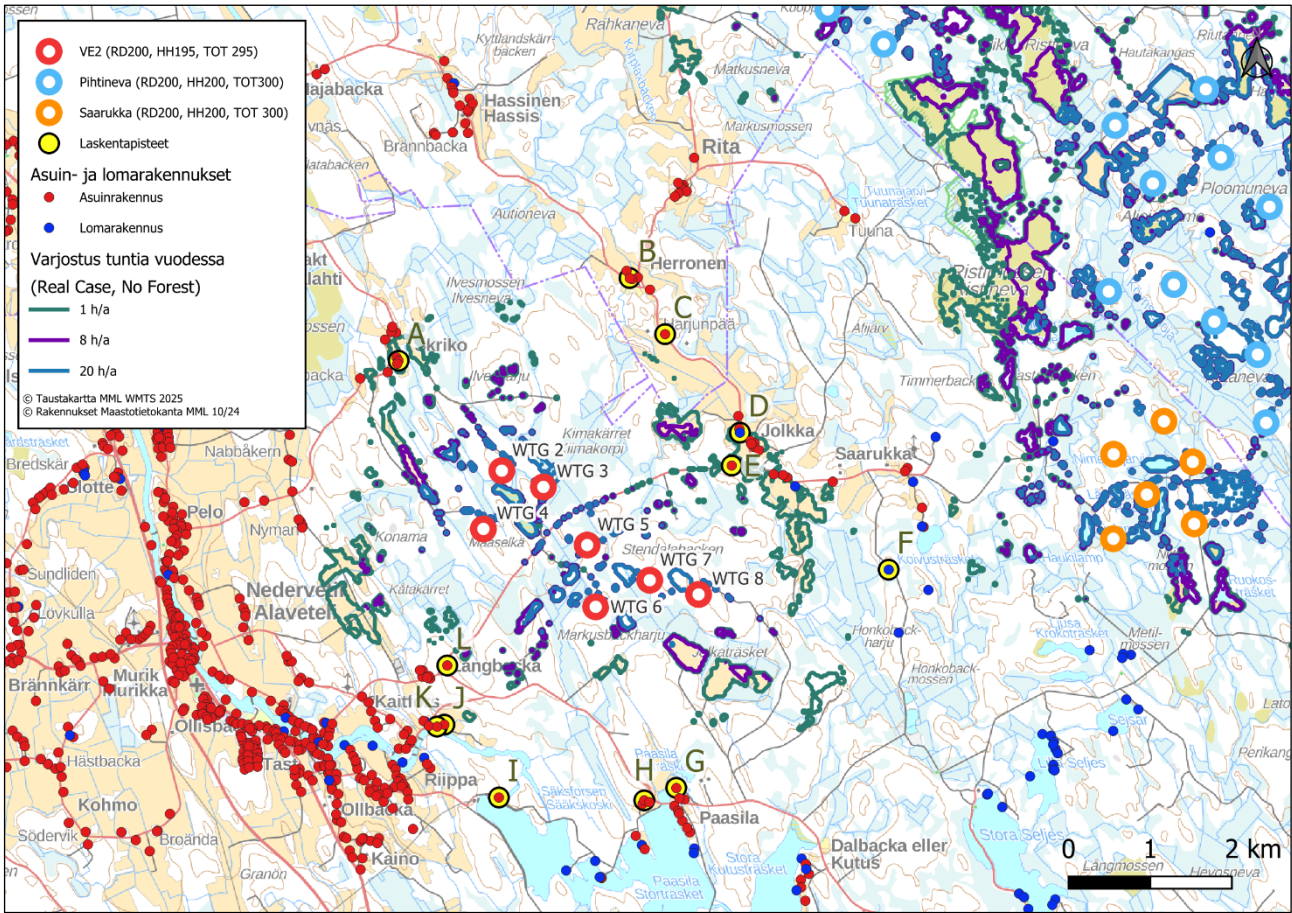


Bild 12. Resultat av modelleringen av sammantagna skuggeffekter i projektalternativ 2 (den skyddande effekten från träd har beaktats).

Tabell 24. Resultat av modelleringen av sammantagna skuggeffekter i alternativ 2 när den skyddande effekten från träd har beaktats "Real Case, Luke Forest".

Beräkningspunkt	ETRS89-TM35 Ost	ETRS89-TM35 Norr	Z (m)	Beräkningsfönster (m)	Skuggeffekter (h/a)
A - Bostadsbyggnad	321194	7073316	32	5,0 x 5,0	2:20
B - Bostadsbyggnad	324024	7074328	24,7	5,0 x 5,0	0:00
C - Bostadsbyggnad	324459	7073641	29,1	5,0 x 5,0	0:00
D - Fritidsbyggnad	325375	7072435	30	5,0 x 5,0	2:17
E - Bostadsbyggnad	325275	7072032	32,5	5,0 x 5,0	4:34
F - Fritidsbyggnad	327197	7070758	47,1	5,0 x 5,0	0:00
G - Bostadsbyggnad	324595	7068088	51,4	5,0 x 5,0	0:00
H - Bostadsbyggnad	324203	7067934	55,2	5,0 x 5,0	0:00
I - Bostadsbyggnad	322423	7067969	42,5	5,0 x 5,0	0:00
J - Bostadsbyggnad	321755	7068860	35	5,0 x 5,0	0:00
K - Bostadsbyggnad	321664	7068837	33,5	5,0 x 5,0	0:00
L - Bostadsbyggnad	321791	7069585	50	5,0 x 5,0	0:00

17.02.2026

Källor

Keränen, J., Hongisto, V. & Hakala, J. 2019. The sound insulation of façades at frequencies 5–5000 Hz. *Building and Environment*, 156 12–20.

Miljöministeriet 2014. Tuulivoimaloiden melun mallintaminen. Miljöförvaltningens anvisningar 2/2014.

Miljöministeriet 2016. Planering av vindkraftsutbyggnad. Miljöförvaltningens anvisningar 6/2016.

Social- och hälsovårdsministeriets förordning om sanitära förhållanden i bostäder och andra vistelseutrymmen samt om kompetenskrav för utomstående sakkunniga 545/2015.

Statsrådets förordning om riktvärden för utomhusbuller från vindkraftverk 1107/2015.

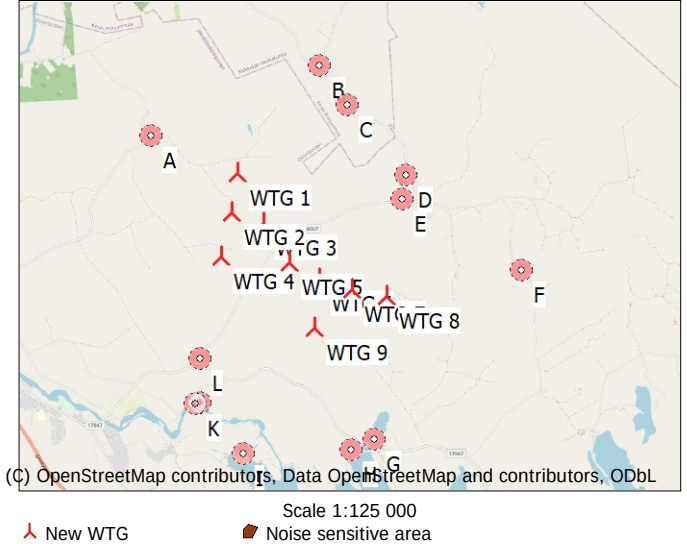
Bilaga 1. Resultat från modelleringen av spridningen av buller ISO 9613-2, YM 2 /2014 - Projektalternativ ALT1

DECIBEL - Main Result

Calculation: VE1_Jolkka_V172x9xHH209_291025

Calculation is done according to Finnish guideline "Ympäristöhallinnon ohjeita 2 | 2014" from the Ministry of the Environment of Finland

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)]	Uncertainty [dB(A)]
					Valid	Manufact.				Creator	Name			
			[m]											
WTG 1	322 570	7 072 630	39,7	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 2	322 459	7 071 970	42,5	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 3	322 968	7 071 771	35,0	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 4	322 233	7 071 257	44,6	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 5	323 349	7 071 090	40,0	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 6	323 833	7 070 792	45,0	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 7	324 359	7 070 588	48,8	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 8	324 934	7 070 443	50,7	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 9	323 712	7 069 988	49,7	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0

Calculation Results

Sound level

Noise sensitive area

No.	Name	East	North	Z	Immission height [m]	Demands Noise [dB(A)]	Sound level From WTGs [dB(A)]	Distance to noise demand [m]	2 dB penalty applied for one or more WTGs
A	A - Asuinrakennus	321 194	7 073 316	32,0	4,0	40,0	34,2	771	No
B	B - Asuinrakennus	324 024	7 074 328	24,7	4,0	40,0	31,0	1 489	No
C	C - Asuinrakennus	324 459	7 073 641	29,1	4,0	40,0	32,5	1 319	No
D	D - Lomarakenus	325 375	7 072 435	30,0	4,0	40,0	33,8	1 084	No
E	E - Asuinrakennus	325 275	7 072 032	32,5	4,0	40,0	35,6	690	No
F	F - Lomarakenus	327 197	7 070 758	47,1	4,0	40,0	29,9	1 576	No
G	G - Asuinrakennus	324 595	7 068 088	51,4	4,0	40,0	31,9	1 303	No
H	H - Asuinrakennus	324 203	7 067 934	55,2	4,0	40,0	31,5	1 351	No
I	I - Asuinrakennus	322 423	7 067 969	42,5	4,0	40,0	30,4	1 651	No
J	J - Asuinrakennus	321 755	7 068 860	35,0	4,0	40,0	32,1	1 454	No
K	K - Asuinrakennus	321 664	7 068 837	33,5	4,0	40,0	31,7	1 540	No
L	L - Asuinrakennus	321 791	7 069 585	50,0	4,0	40,0	34,7	903	No

Distances (m)

WTG										
NSA	WTG 1	WTG 2	WTG 3	WTG 4	WTG 5	WTG 6	WTG 7	WTG 8	WTG 9	
A	1537	1846	2352	2306	3097	3650	4177	4715	4172	
B	2235	2830	2766	3554	3306	3540	3754	3990	4350	
C	2142	2606	2391	3261	2781	2916	3054	3233	3728	
D	2811	2953	2497	3355	2432	2253	2108	2041	2958	
E	2770	2817	2322	3139	2144	1902	1710	1626	2573	

To be continued on next page...

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

17.2.2026 10.13/4.2.285

DECIBEL - Main Result

Calculation: VE1_Jolkka_V172x9xHH209_291025

...continued from previous page

	WTG								
NSA	WTG 1	WTG 2	WTG 3	WTG 4	WTG 5	WTG 6	WTG 7	WTG 8	WTG 9
F	4991	4890	4348	4988	3863	3364	2843	2285	3569
G	4973	4430	4026	3952	3251	2809	2511	2379	2095
H	4971	4396	4030	3862	3270	2882	2658	2612	2112
I	4663	4000	3840	3293	3255	3155	3257	3524	2395
J	3856	3187	3152	2443	2740	2837	3125	3550	2258
K	3899	3231	3209	2485	2812	2919	3213	3641	2348
L	3143	2476	2482	1729	2166	2372	2757	3257	1962

DECIBEL - Assumptions for noise calculation

Calculation: VE1_Jolkka_V172x9xHH209_291025

Noise calculation model:

ISO 9613-2:2024 Finland

Wind speed (at 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_Jolkka_meluvälkemallinnus_0.w2r (1)

Area type with hard ground: vesisto_meluvalke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

Selected option: Fixed value: 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:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

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:

Uncertainty added to source noise level of the WTGs in the calculation

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

0,0 dB(A)

Octave data required

Input parameters for calculation of air absorption:

Temperature 15,0 °C

Relative humidity 70,0 %

Pressure 101,325 kPa

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]
0,1	0,4	1,1	2,4	4,1	8,7	26,4	93,7

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V172-7.2 7200 172.0 !O!

Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Manufacturer DMS no.: 0128-4336_01	29.11.2024	USER	13.10.2025 15.56

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	209,0	8,0	107,8	No	89,8	96,8	101,4	100,4	101,0	99,9	98,3	85,5

Noise sensitive area: A A - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: B B - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

DECIBEL - Assumptions for noise calculation

Calculation: VE1_Jolkka_V172x9xHH209_291025

Noise sensitive area: C C - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: D D - Lomarakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: E E - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: F F - Lomarakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: G G - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: H H - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: I I - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: J J - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Project:

Jolkka_meluväikemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

17.2.2026 10.13/4.2.285

DECIBEL - Assumptions for noise calculation

Calculation: VE1_Jolkka_V172x9xHH209_291025

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: K K - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: L L - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

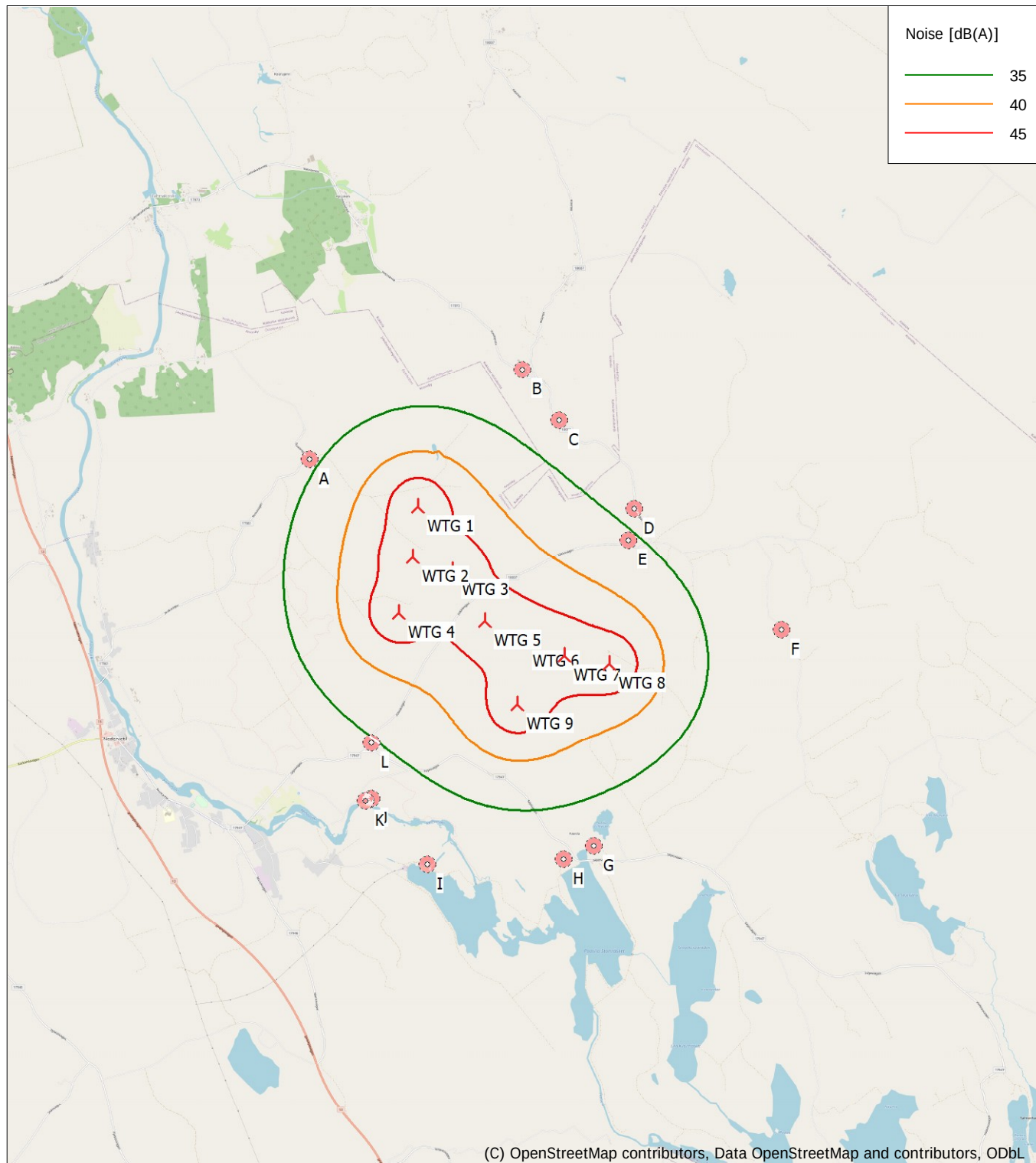
Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

DECIBEL - Map 8,0 m/s

Calculation: VE1_Jolkka_V172x9xHH209_291025



Map: EMD OpenStreetMap, Print scale 1:75 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 323 583 North: 7 071 309

New WTG Noise sensitive area

Noise calculation model: ISO 9613-2:2024 Finland. Wind speed: 8,0 m/s
Height above sea level from active line object

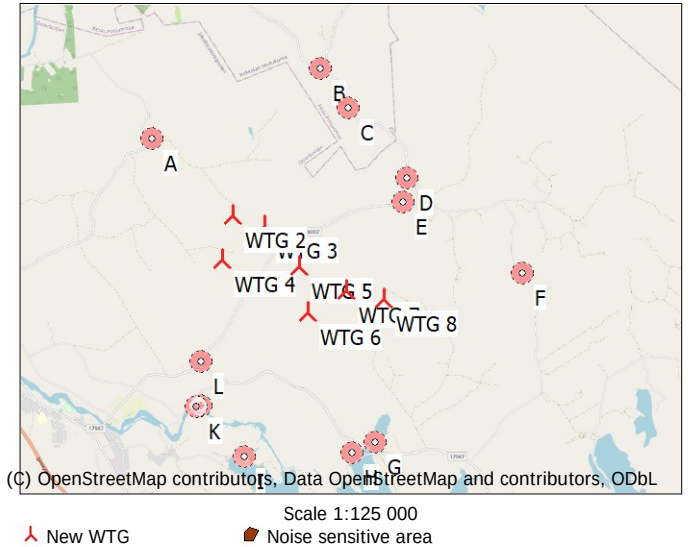
Bilaga 2. Resultat från modelleringen av spridningen av buller ISO 9613-2, YM 2 /2014 - Projektalternativ ALT2

DECIBEL - Main Result

Calculation: VE2_Jolkka_V172x7xHH209_291025

Calculation is done according to Finnish guideline "Ympäristöhallinnon ohjeita 2 | 2014" from the Ministry of the Environment of Finland

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)]	Uncertainty [dB(A)]
					Valid	Manufact.					Creator	Name			
			[m]												
WTG 2	322 459	7 071 970	42,5	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 3	322 968	7 071 771	35,0	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 4	322 233	7 071 257	44,6	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 5	323 504	7 071 059	45,0	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 6	323 609	7 070 303	45,5	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 7	324 270	7 070 629	45,0	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0
WTG 8	324 869	7 070 455	48,0	VESTAS V172-7.2 7200 17...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7,2 MW PO7200 STE	8,0	107,8	0,0

Calculation Results

Sound level

Noise sensitive area

No.	Name	East	North	Z	Immission height [m]	Demands Noise [dB(A)]	Sound level		Distance to noise demand [m]	2 dB penalty applied for one or more WTGs
							From WTGs [dB(A)]			
A	A - Asuinrakennus	321 194	7 073 316	32,0	4,0	40,0	31,9		1 106	No
B	B - Asuinrakennus	324 024	7 074 328	24,7	4,0	40,0	29,1		1 917	No
C	C - Asuinrakennus	324 459	7 073 641	29,1	4,0	40,0	31,0		1 557	No
D	D - Lomarakenus	325 375	7 072 435	30,0	4,0	40,0	32,9		1 176	No
E	E - Asuinrakennus	325 275	7 072 032	32,5	4,0	40,0	34,8		777	No
F	F - Lomarakenus	327 197	7 070 758	47,1	4,0	40,0	29,0		1 663	No
G	G - Asuinrakennus	324 595	7 068 088	51,4	4,0	40,0	30,7		1 540	No
H	H - Asuinrakennus	324 203	7 067 934	55,2	4,0	40,0	30,2		1 632	No
I	I - Asuinrakennus	322 423	7 067 969	42,5	4,0	40,0	29,3		1 866	No
J	J - Asuinrakennus	321 755	7 068 860	35,0	4,0	40,0	31,2		1 558	No
K	K - Asuinrakennus	321 664	7 068 837	33,5	4,0	40,0	30,9		1 640	No
L	L - Asuinrakennus	321 791	7 069 585	50,0	4,0	40,0	34,0		959	No

Distances (m)

WTG

NSA	WTG 2	WTG 3	WTG 4	WTG 5	WTG 6	WTG 7	WTG 8
A	1846	2352	2306	3229	3860	4083	4656
B	2830	2766	3554	3309	4045	3706	3964
C	2606	2391	3261	2752	3444	3017	3212
D	2953	2497	3355	2322	2768	2117	2044
E	2817	2322	3139	2020	2401	1726	1629
F	4890	4348	4988	3705	3617	2929	2347
G	4430	4026	3952	3165	2424	2561	2382

To be continued on next page...

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

17.2.2026 10.14/4.2.285

DECIBEL - Main Result

Calculation: VE2_Jolkka_V172x7xHH209_291025

...continued from previous page

	WTG						
NSA	WTG 2	WTG 3	WTG 4	WTG 5	WTG 6	WTG 7	WTG 8
H	4396	4030	3862	3202	2442	2695	2607
I	4000	3840	3293	3273	2618	3238	3487
J	3187	3152	2443	2809	2349	3074	3498
K	3231	3209	2485	2884	2434	3162	3589
L	2476	2482	1729	2260	1954	2690	3198

DECIBEL - Assumptions for noise calculation

Calculation: VE2_Jolkka_V172x7xHH209_291025

Noise calculation model:

ISO 9613-2:2024 Finland

Wind speed (at 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_Jolkka_meluvälkemallinnus_0.w2r (1)

Area type with hard ground: vesisto_meluvalke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

Selected option: Fixed value: 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:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

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:

Uncertainty added to source noise level of the WTGs in the calculation

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

0,0 dB(A)

Octave data required

Input parameters for calculation of air absorption:

Temperature 15,0 °C

Relative humidity 70,0 %

Pressure 101,325 kPa

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]
0,1	0,4	1,1	2,4	4,1	8,7	26,4	93,7

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: VESTAS V172-7.2 7200 172.0 !O!

Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Manufacturer DMS no.: 0128-4336_01	29.11.2024	USER	13.10.2025 15.56

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	209,0	8,0	107,8	No	89,8	96,8	101,4	100,4	101,0	99,9	98,3	85,5

Noise sensitive area: A A - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: B B - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

DECIBEL - Assumptions for noise calculation

Calculation: VE2_Jolkka_V172x7xHH209_291025

Noise sensitive area: C C - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: D D - Lomarakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: E E - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: F F - Lomarakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: G G - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: H H - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: I I - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: J J - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

17.2.2026 10.14/4.2.285

DECIBEL - Assumptions for noise calculation

Calculation: VE2_Jolkka_V172x7xHH209_291025

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: K K - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: L L - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

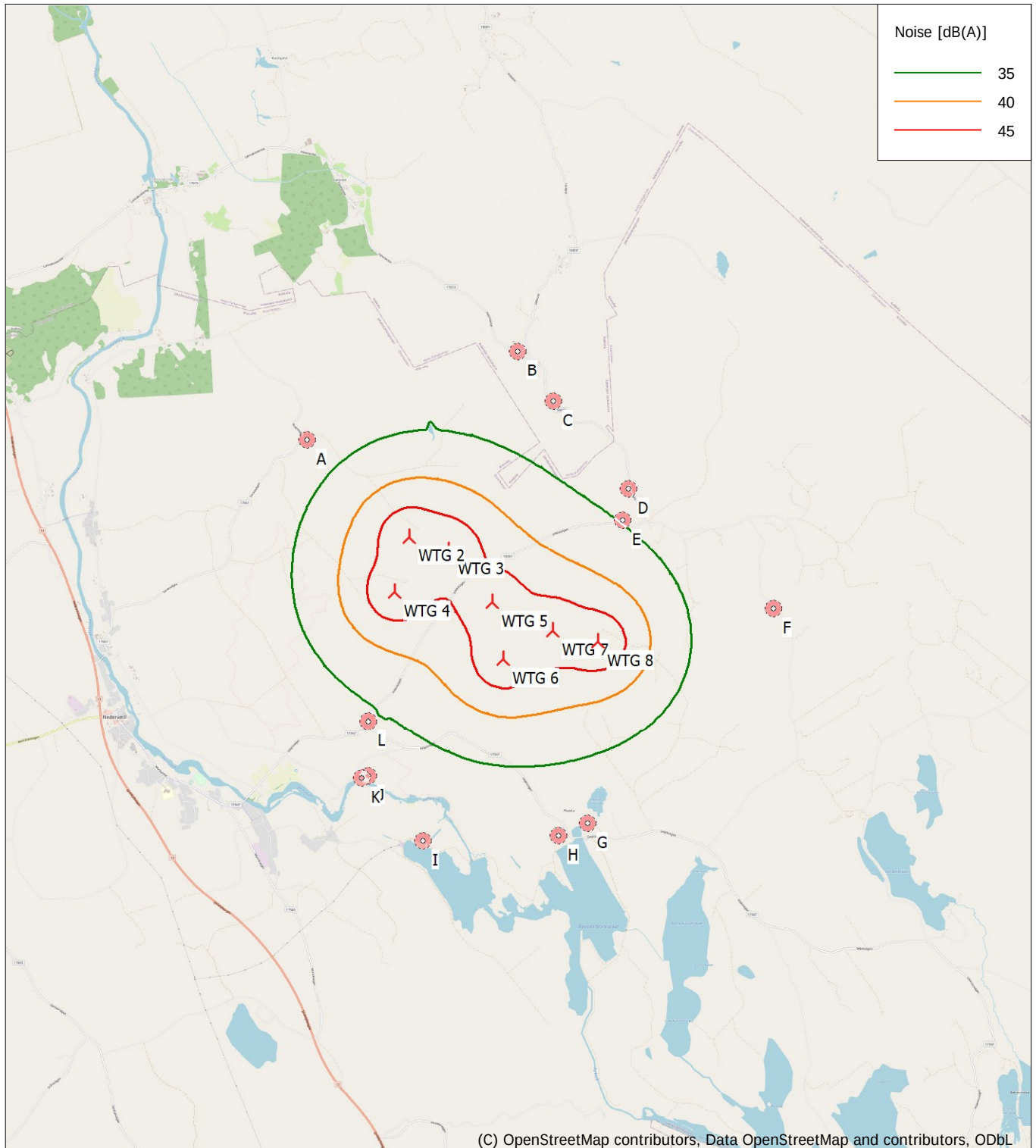
Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

DECIBEL - Map 8,0 m/s

Calculation: VE2_Jolkka_V172x7xHH209_291025

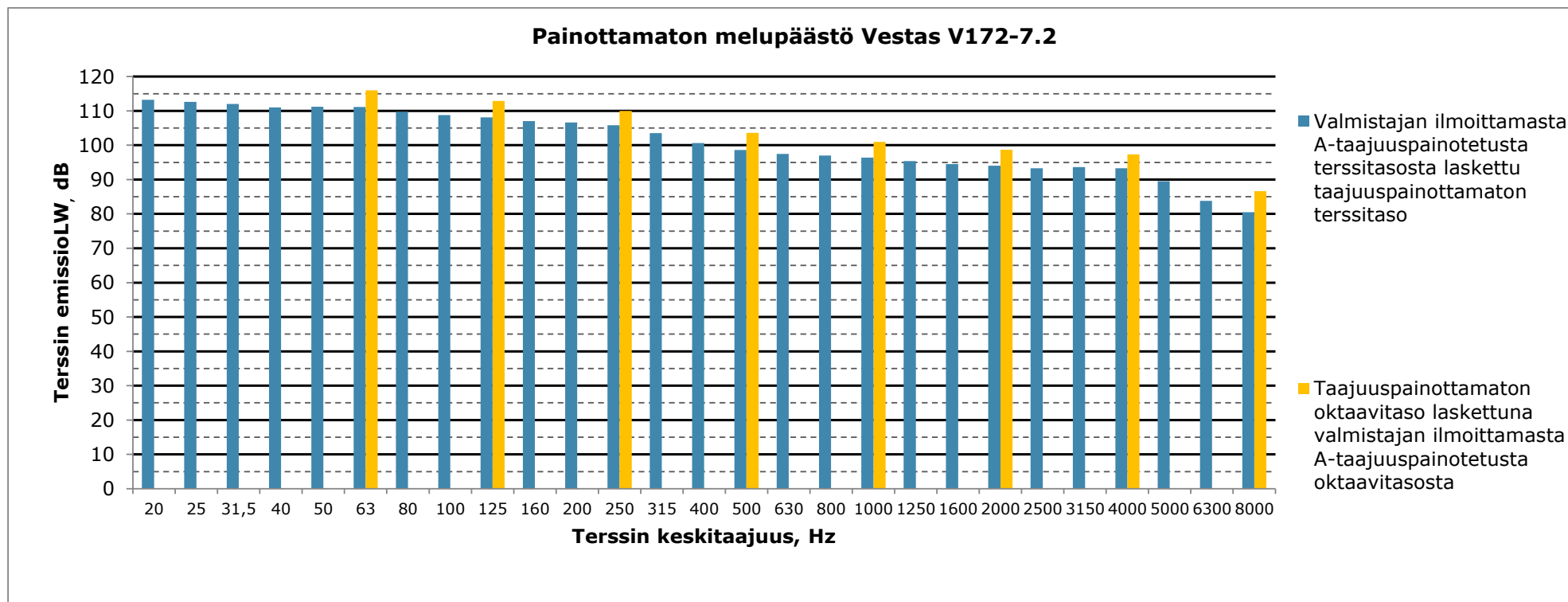


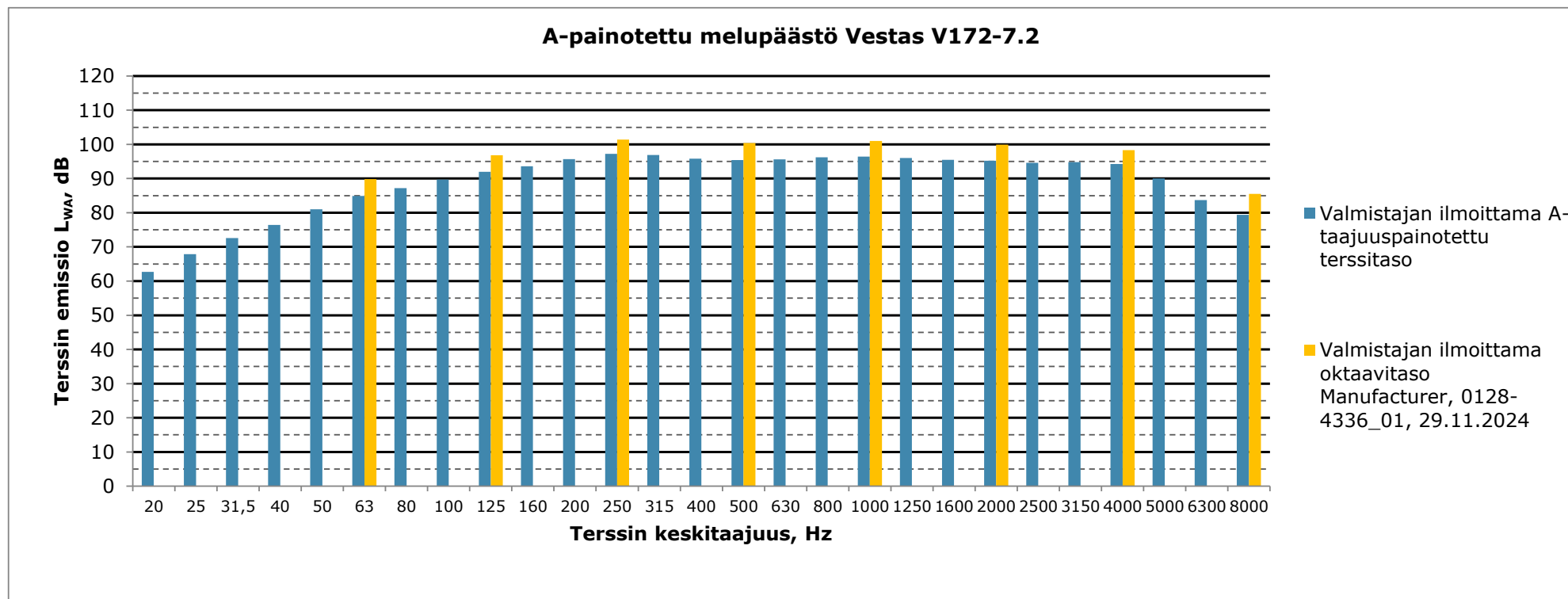
Map: EMD OpenStreetMap, Print scale 1:75 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 323 551 North: 7 071 136

New WTG Noise sensitive area

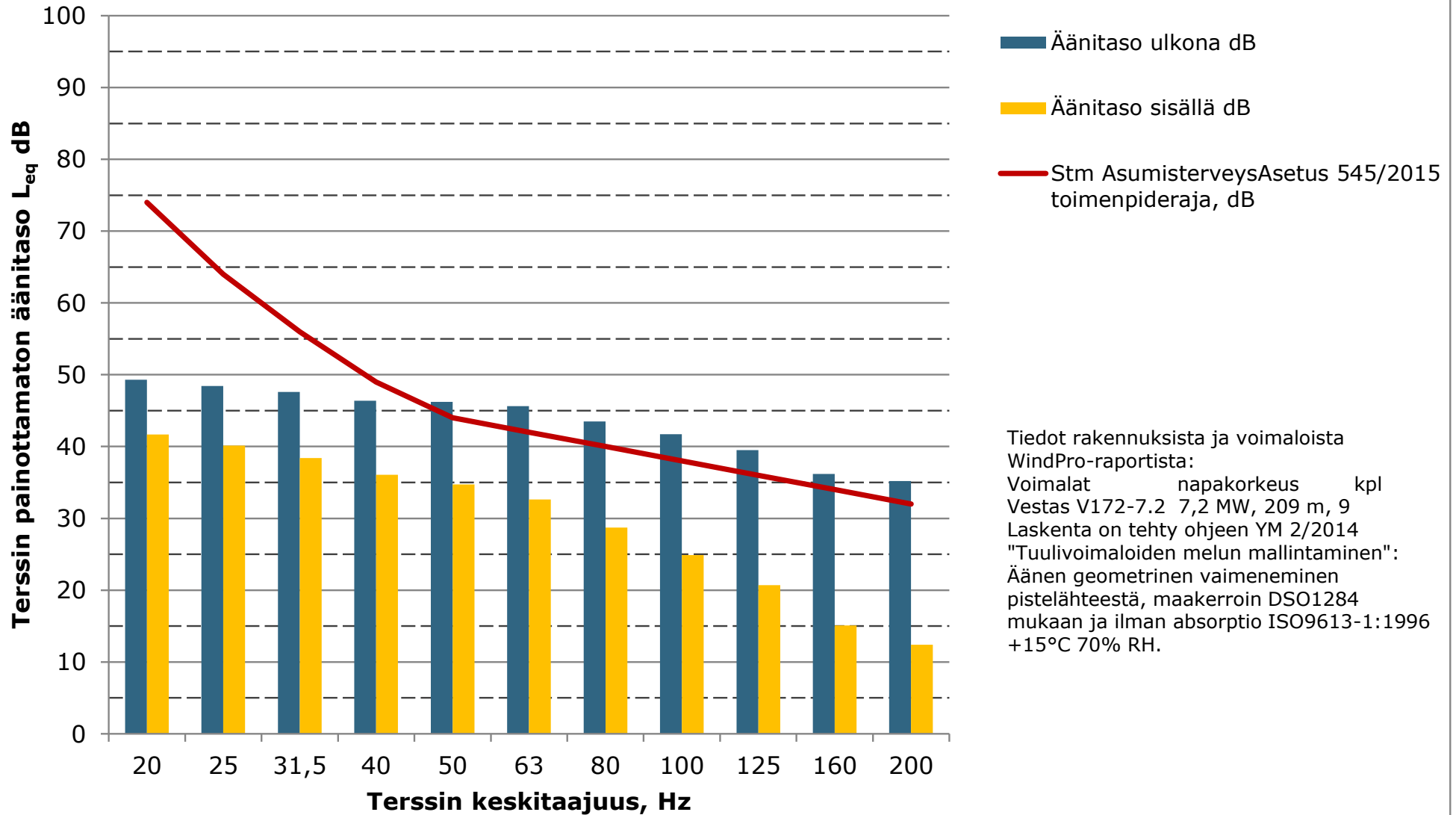
Noise calculation model: ISO 9613-2:2024 Finland. Wind speed: 8,0 m/s
Height above sea level from active line object

Bilaga 3. Värden för lågfrekvent buller vid olika byggnader - Projektalternativ ALT1

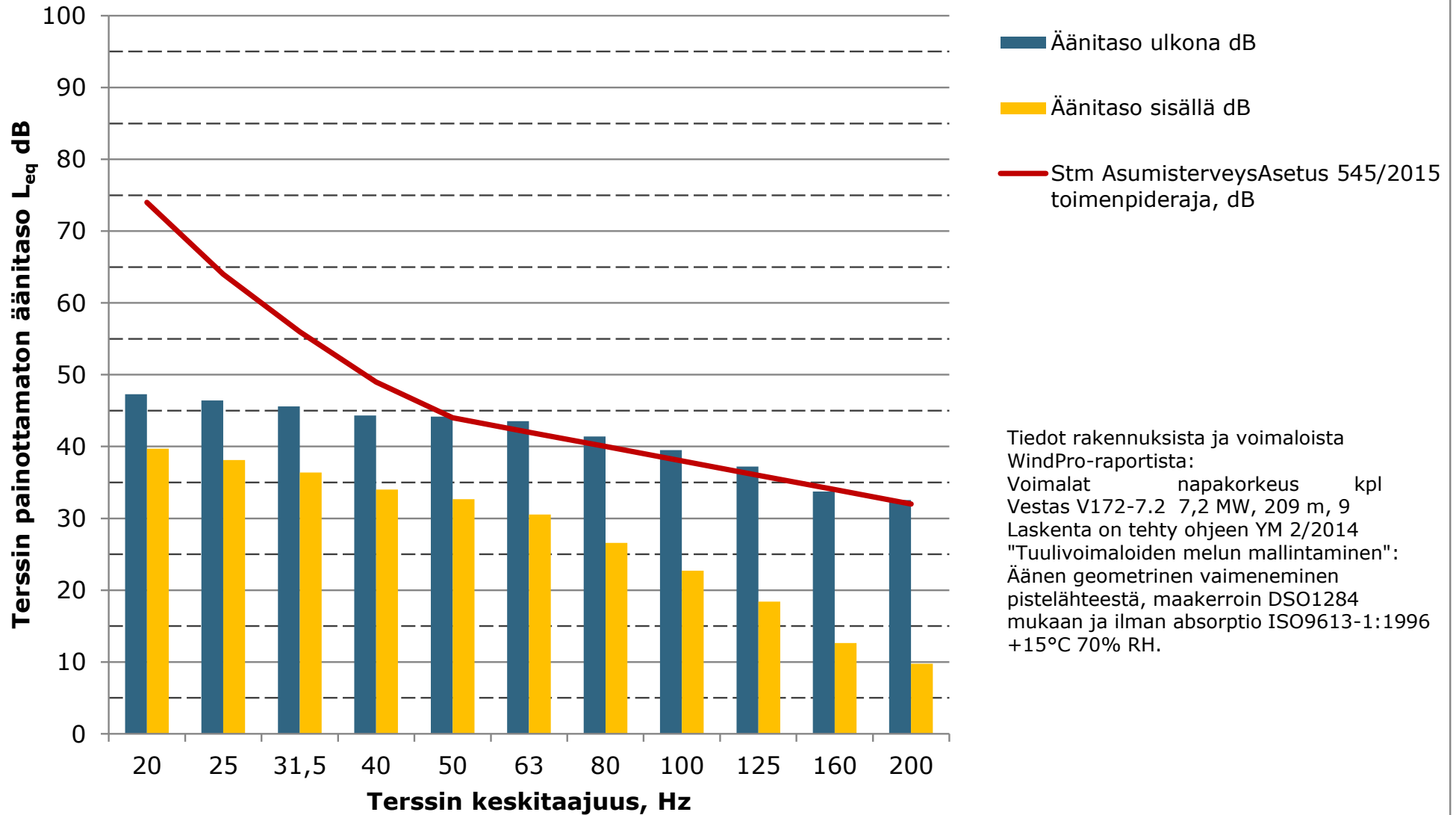




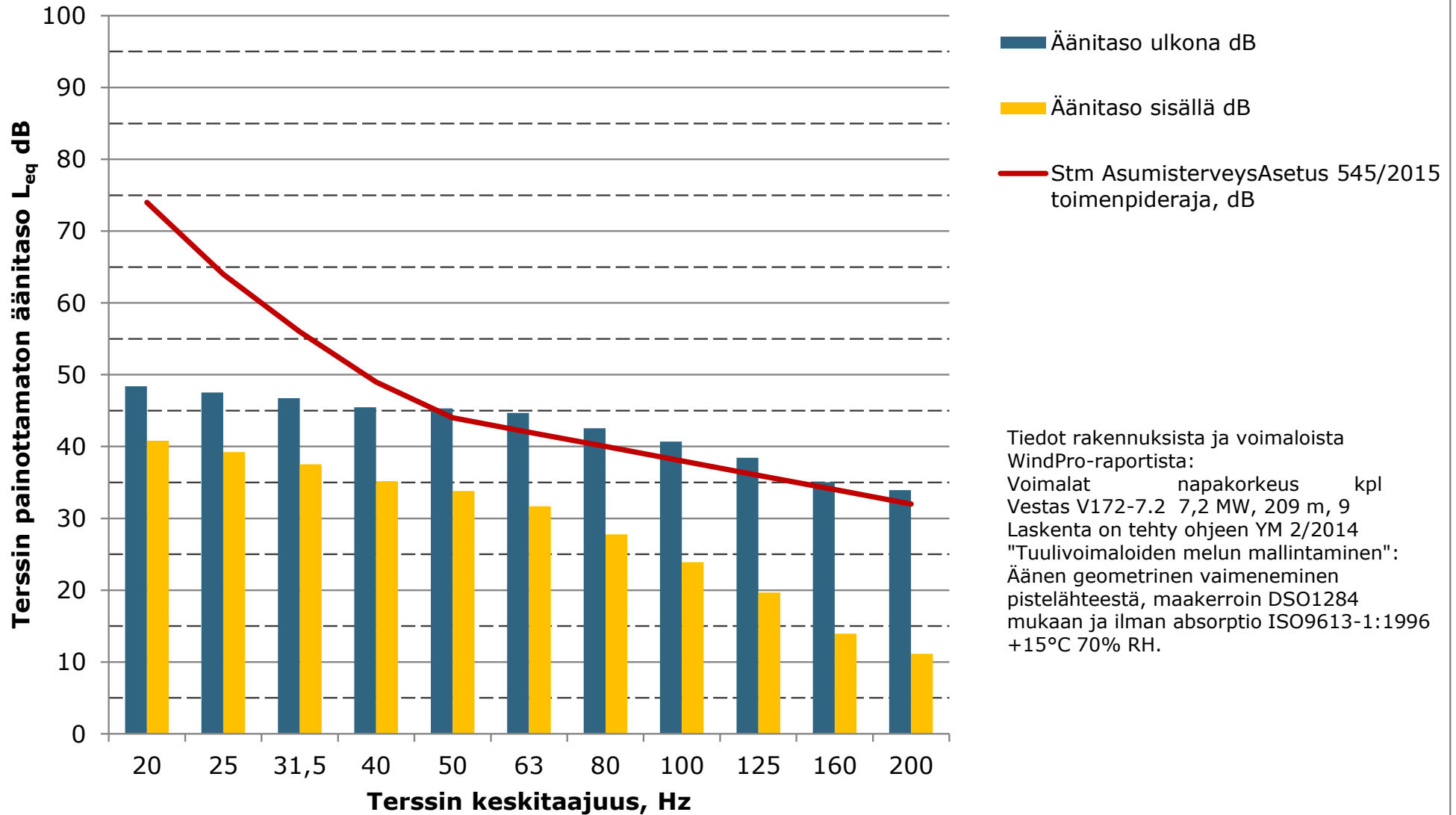
**Matalien taajuuksien äänitasot ulkona ja sisällä, A - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



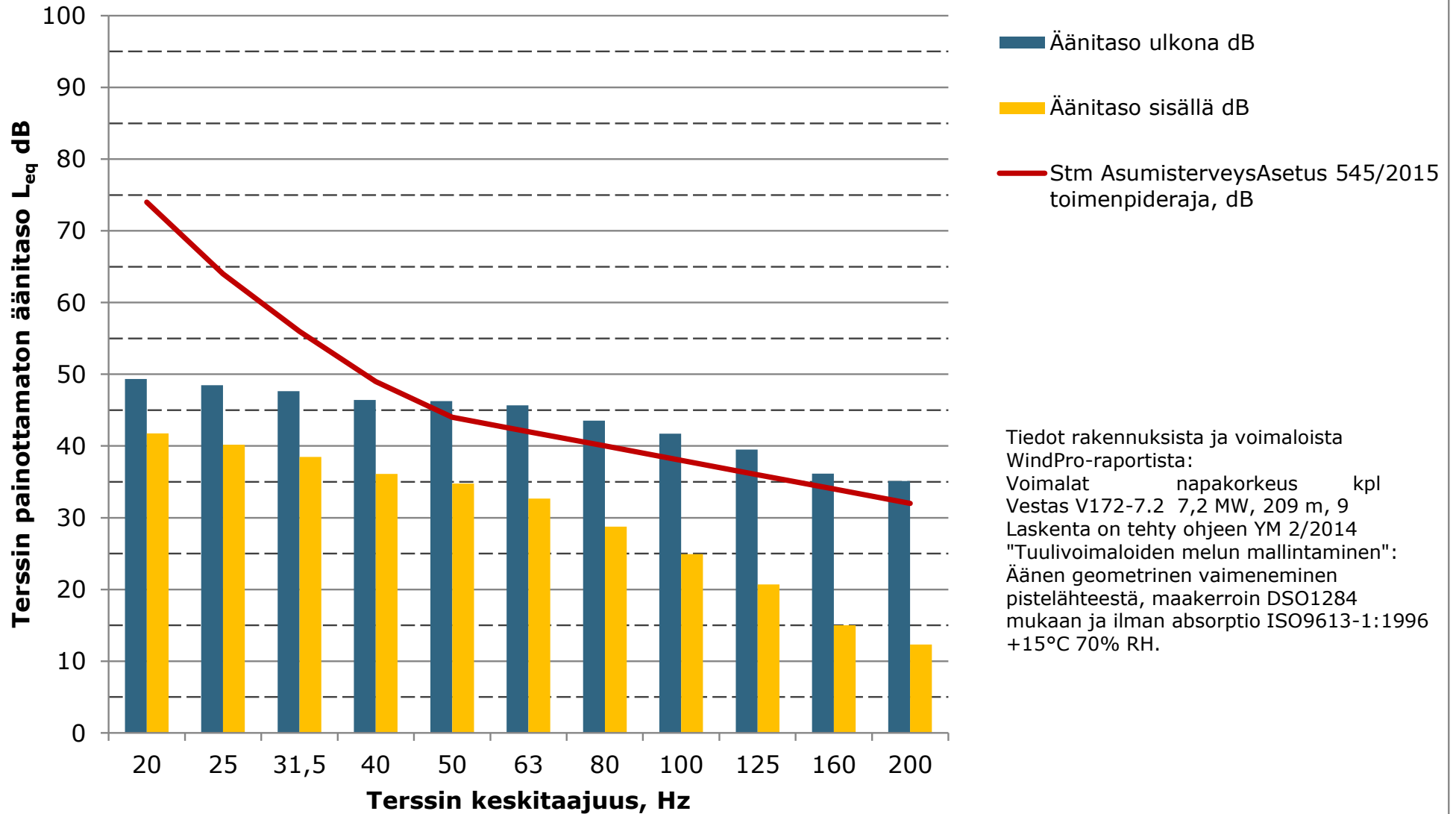
**Matalien taajuuksien äänitasot ulkona ja sisällä, B - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



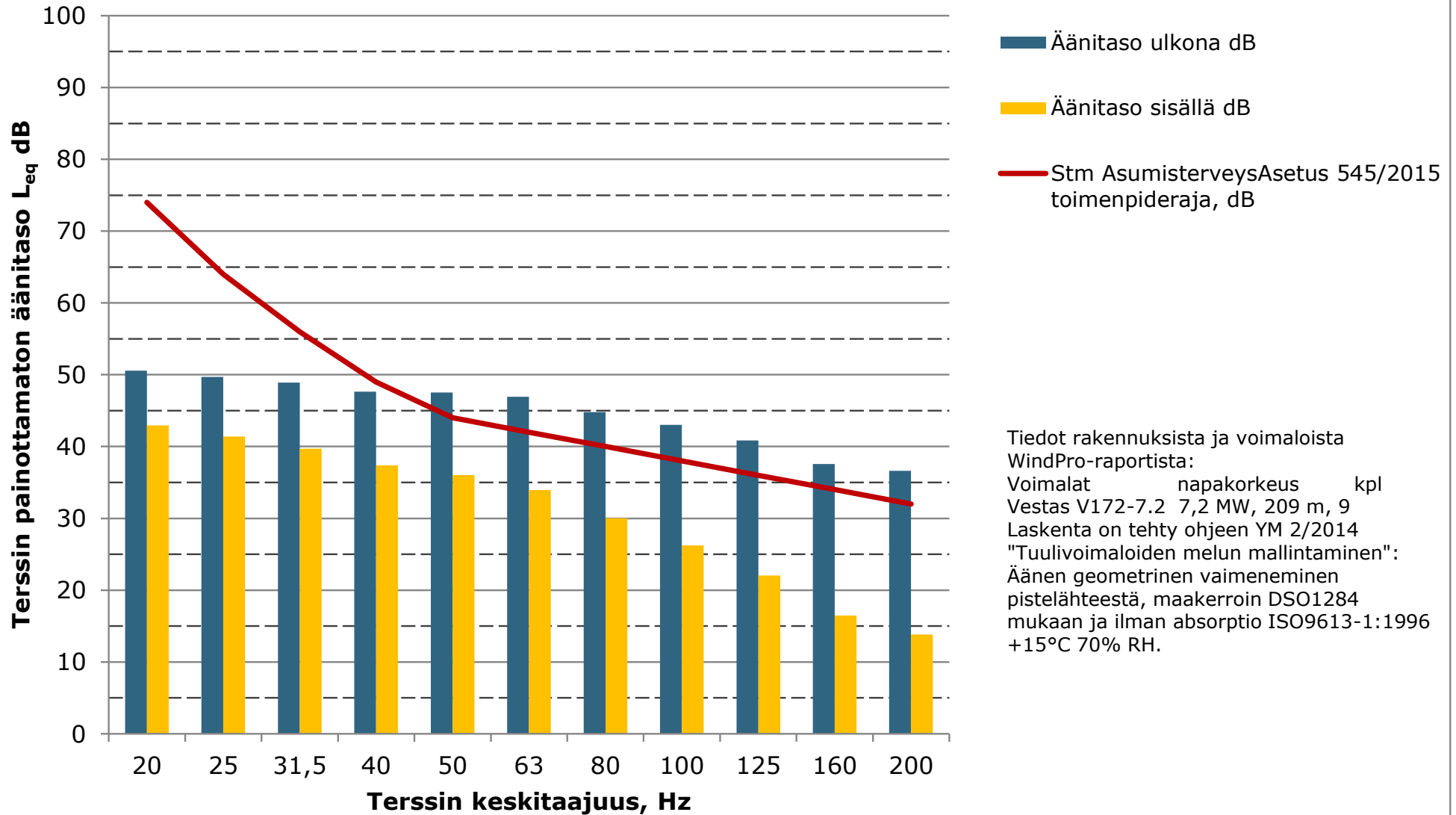
**Matalien taajuuksien äänitasot ulkona ja sisällä, C - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



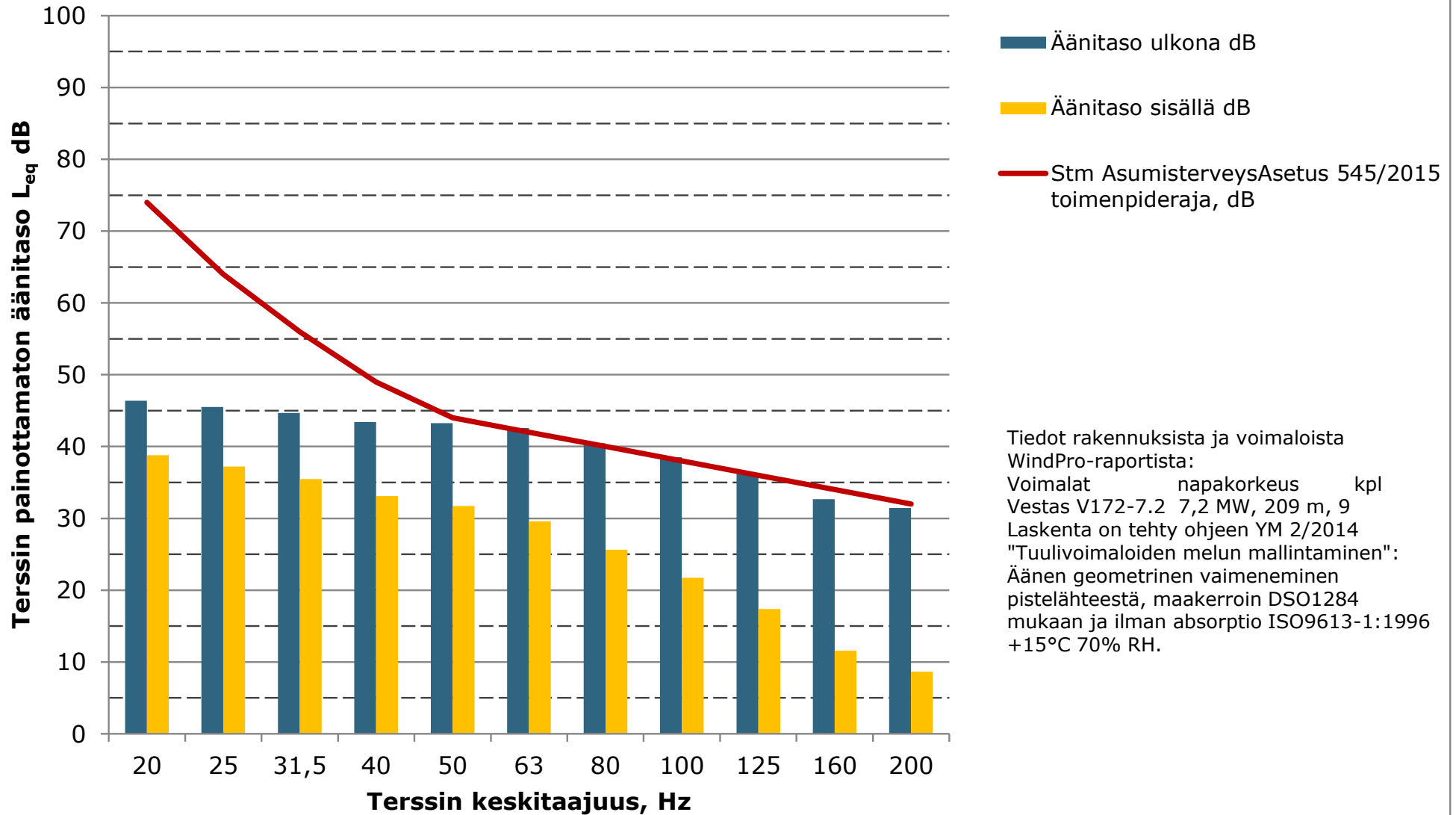
**Matalien taajuuksien äänitasot ulkona ja sisällä, D - Lomarakenus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



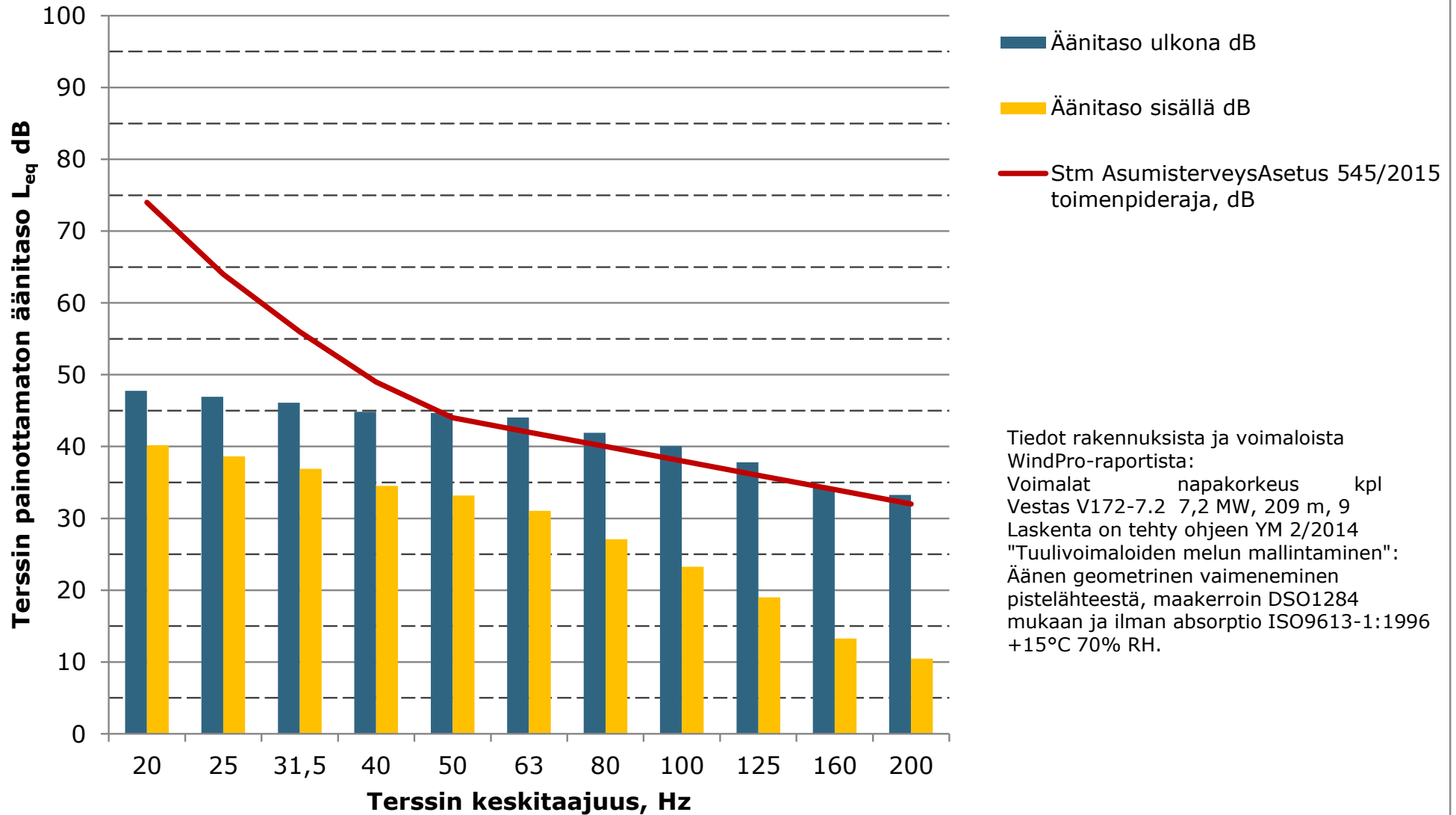
**Matalien taajuuksien äänitasot ulkona ja sisällä, E - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



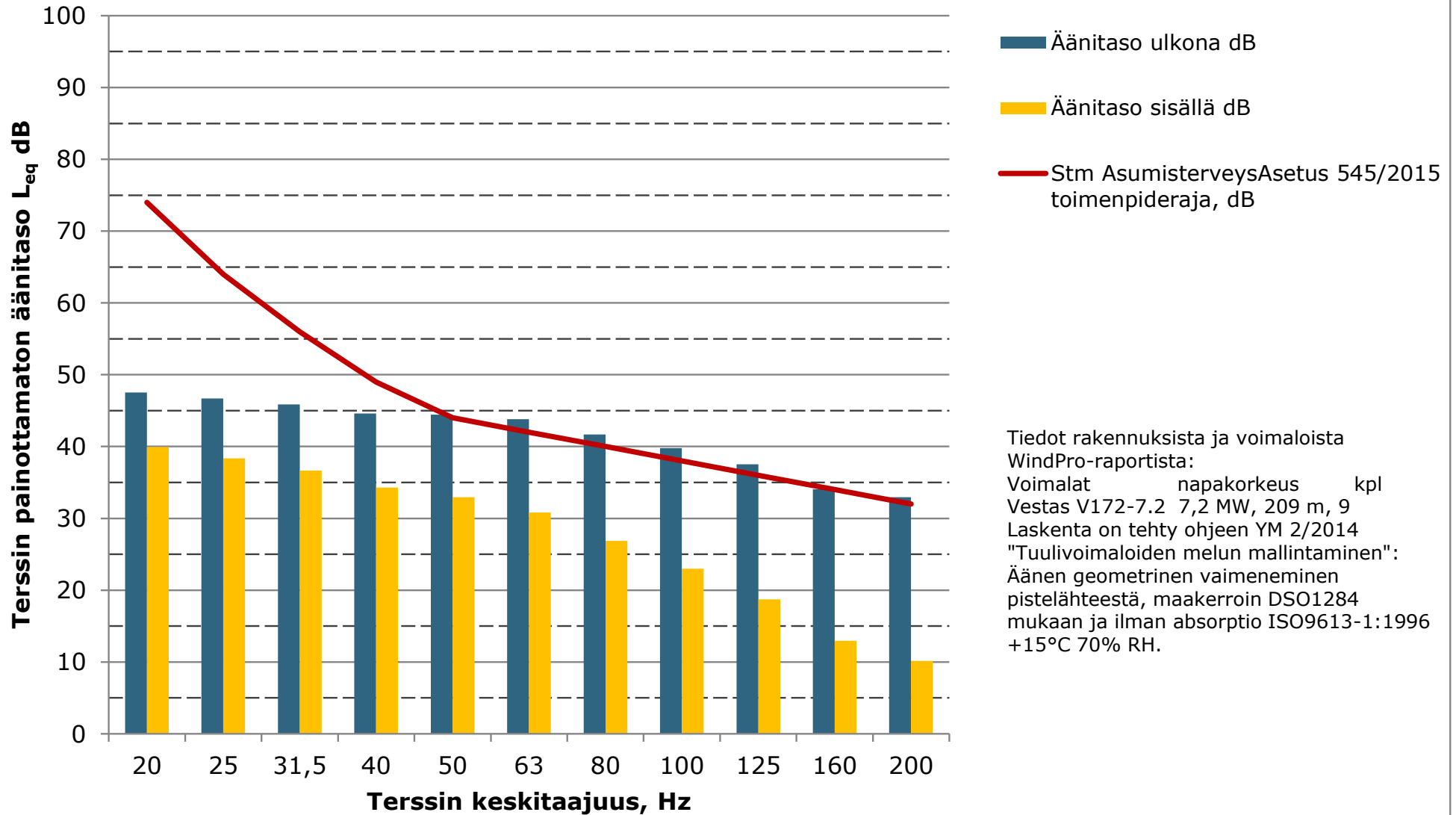
**Matalien taajuuksien äänitasot ulkona ja sisällä, F - Lomarakenus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



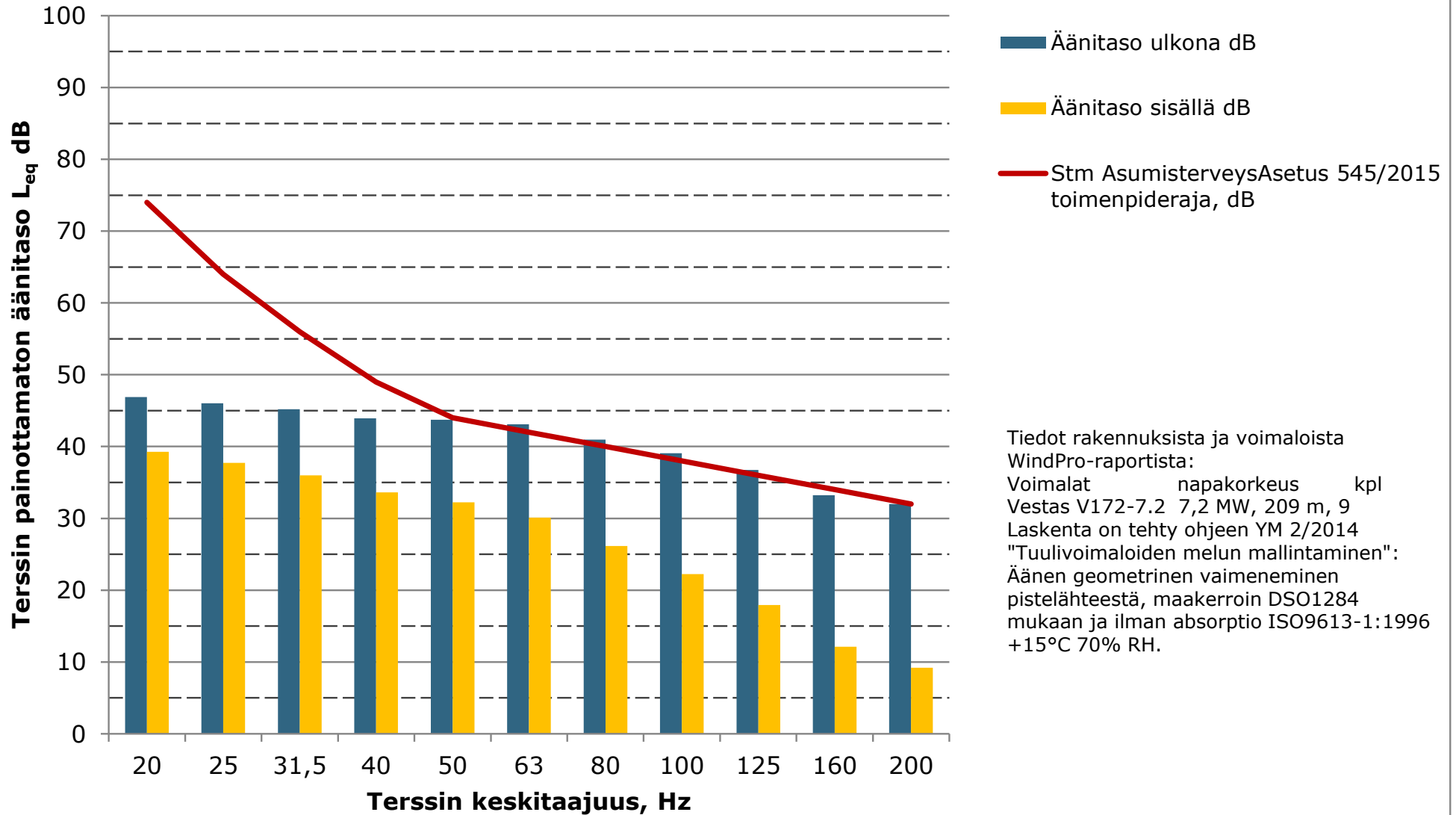
**Matalien taajuuksien äänitasot ulkona ja sisällä, G - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



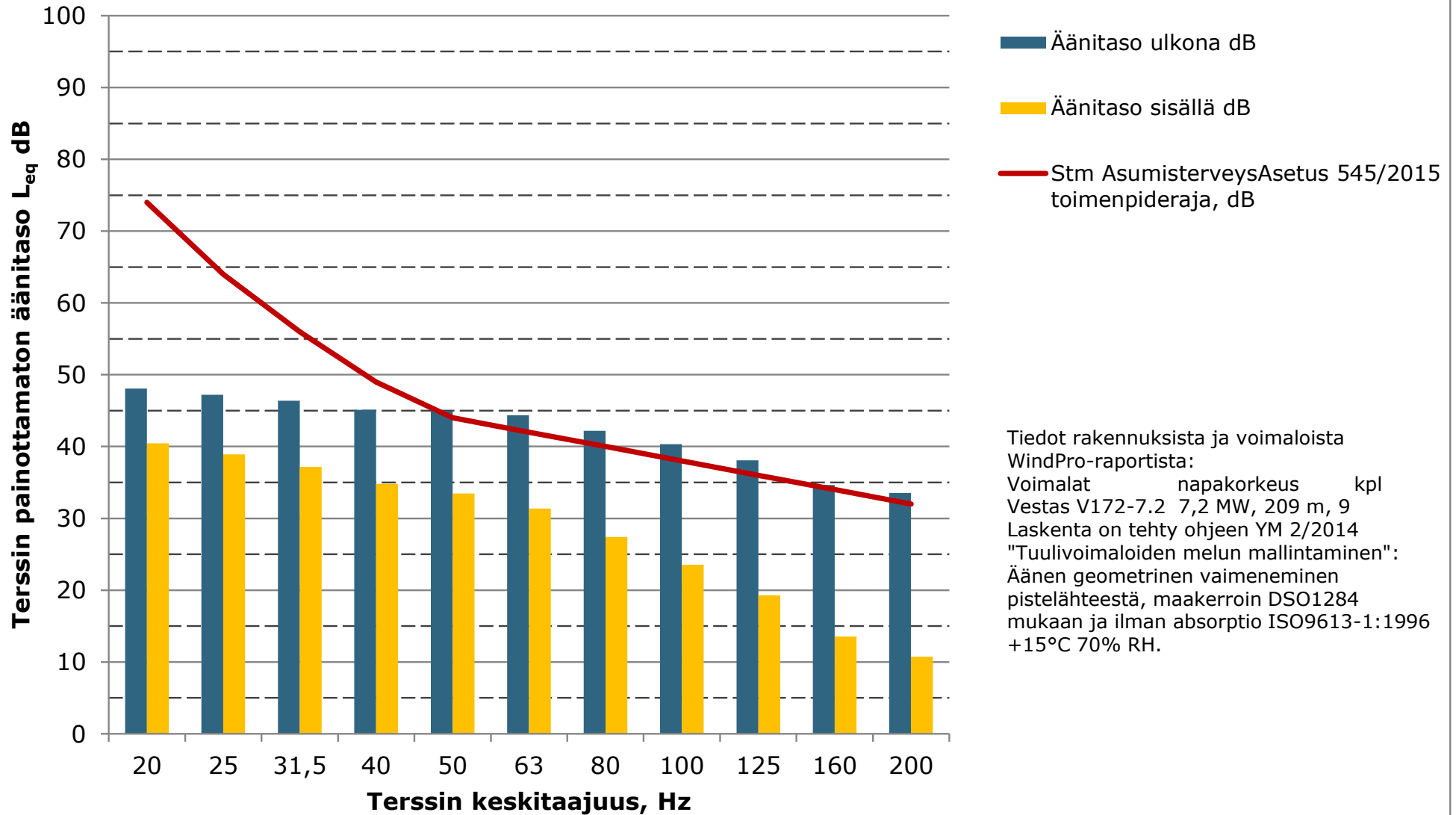
**Matalien taajuuksien äänitasot ulkona ja sisällä, H - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



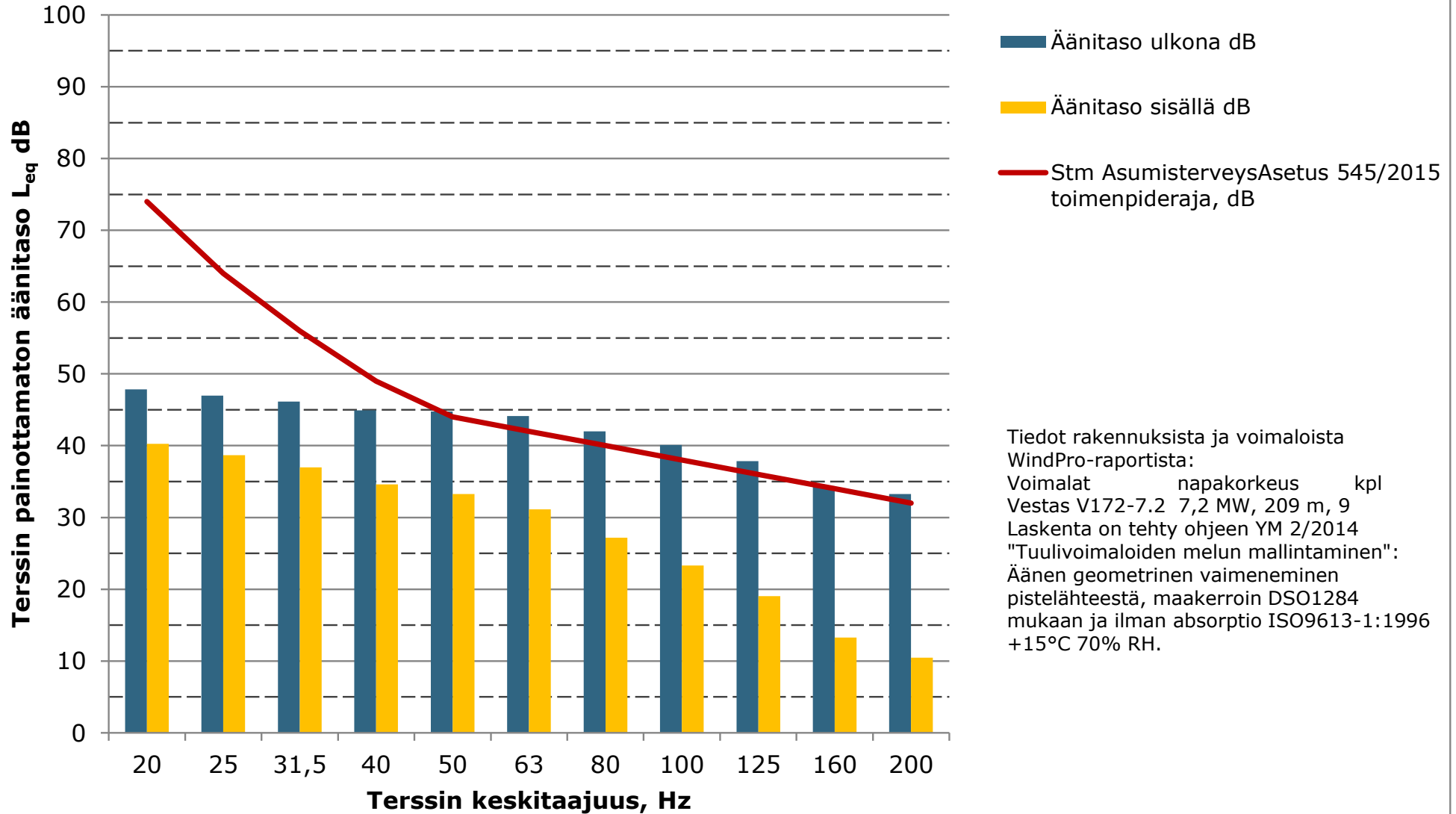
**Matalien taajuuksien äänitasot ulkona ja sisällä, I - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



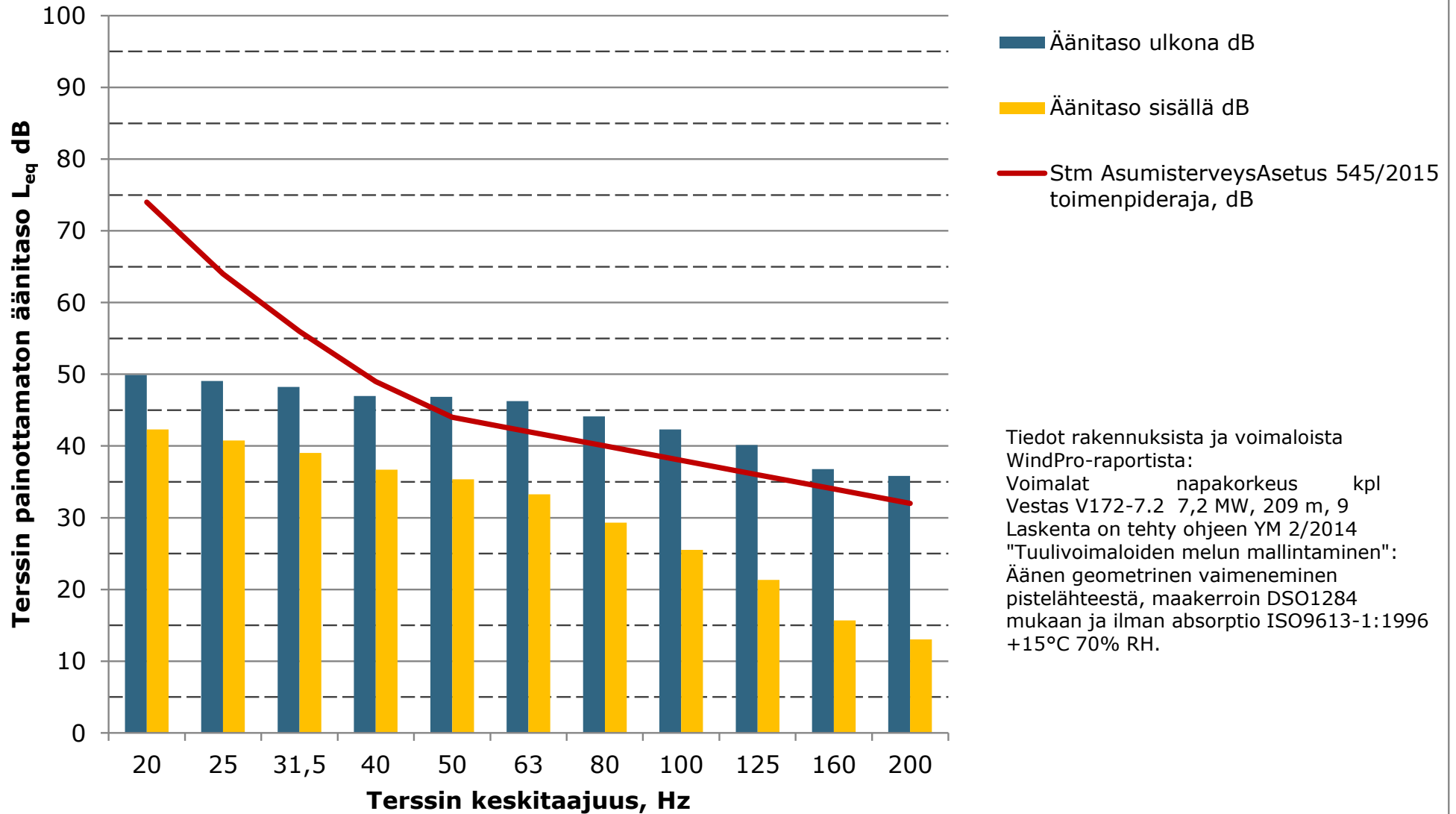
**Matalien taajuuksien äänitasot ulkona ja sisällä, J - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



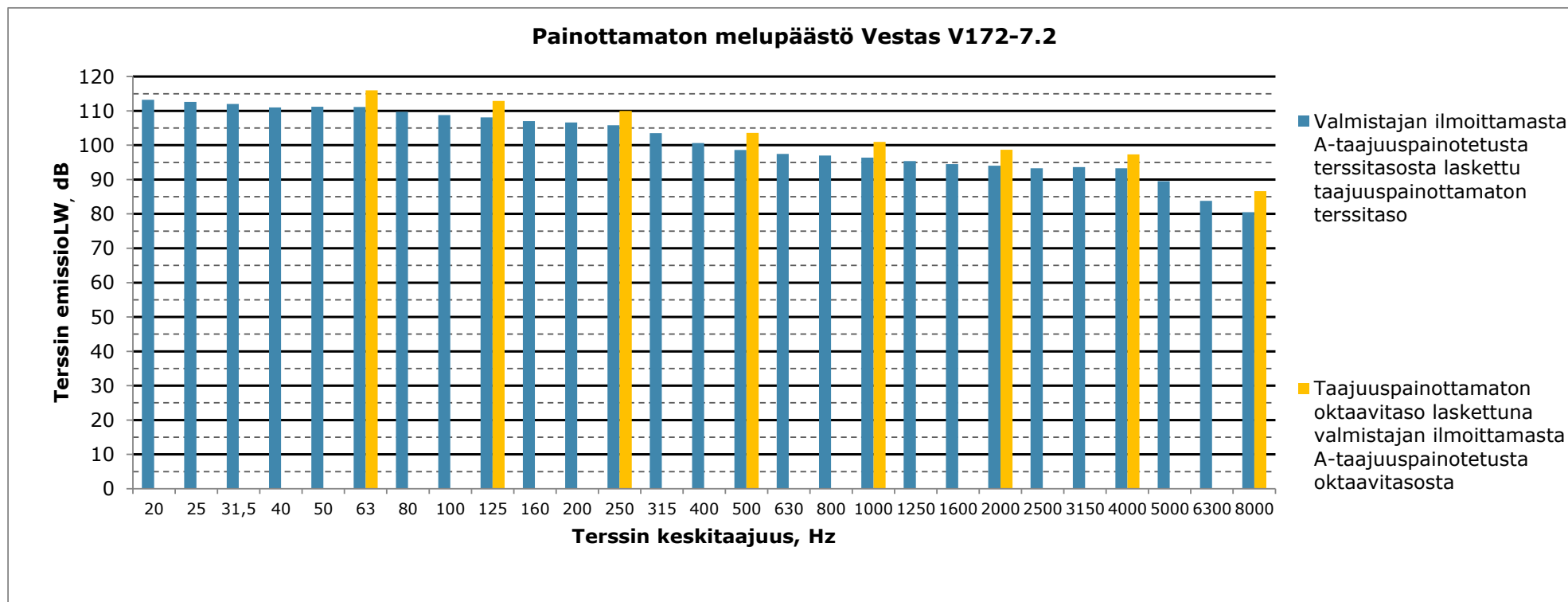
**Matalien taajuuksien äänitasot ulkona ja sisällä, K - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**

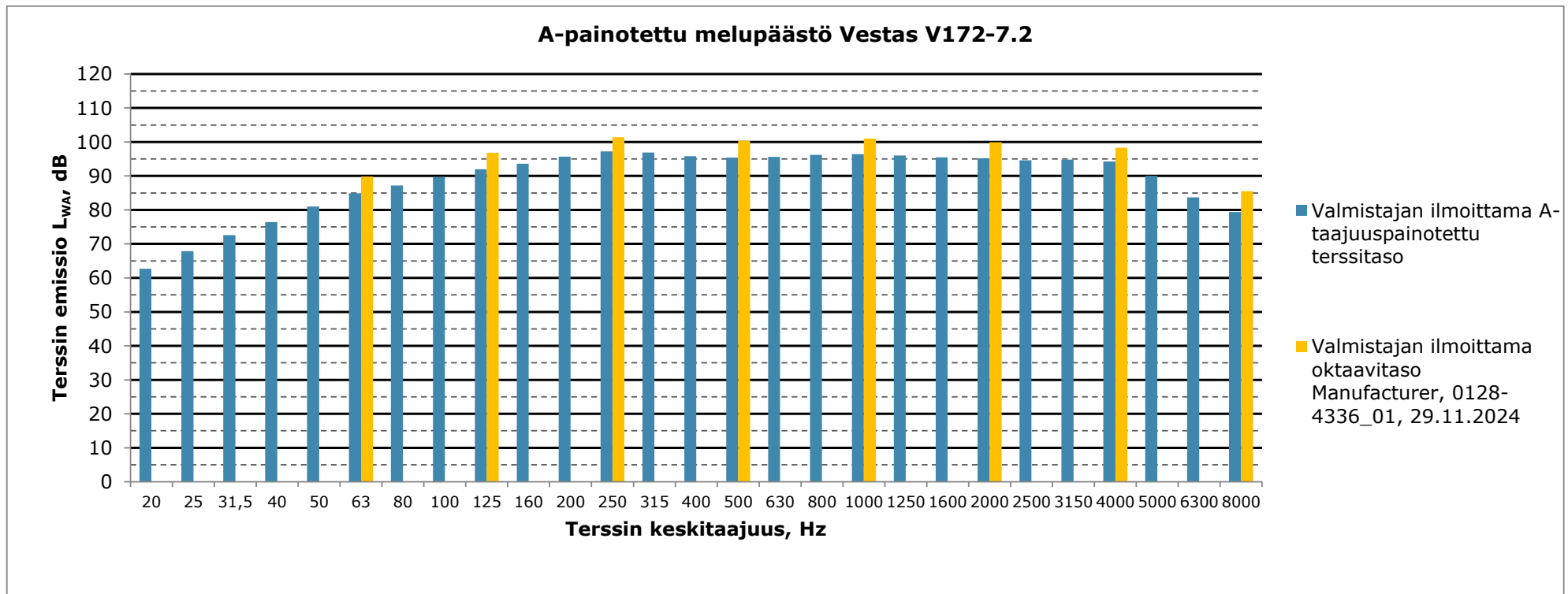


**Matalien taajuuksien äänitasot ulkona ja sisällä, L - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**

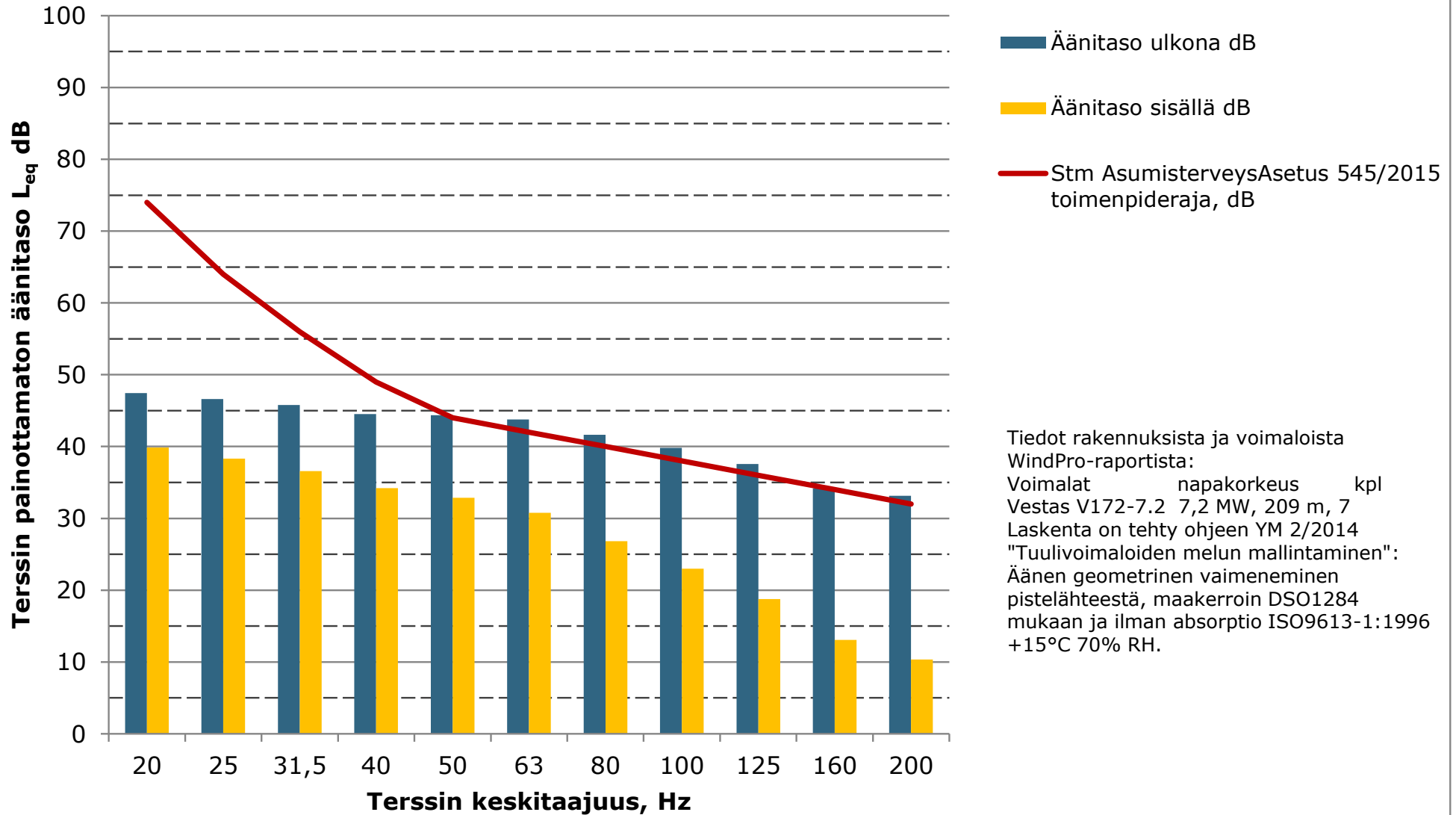


Bilaga 4. Värden för lågfrekvent buller vid olika byggnader - Projektalternativ ALT2

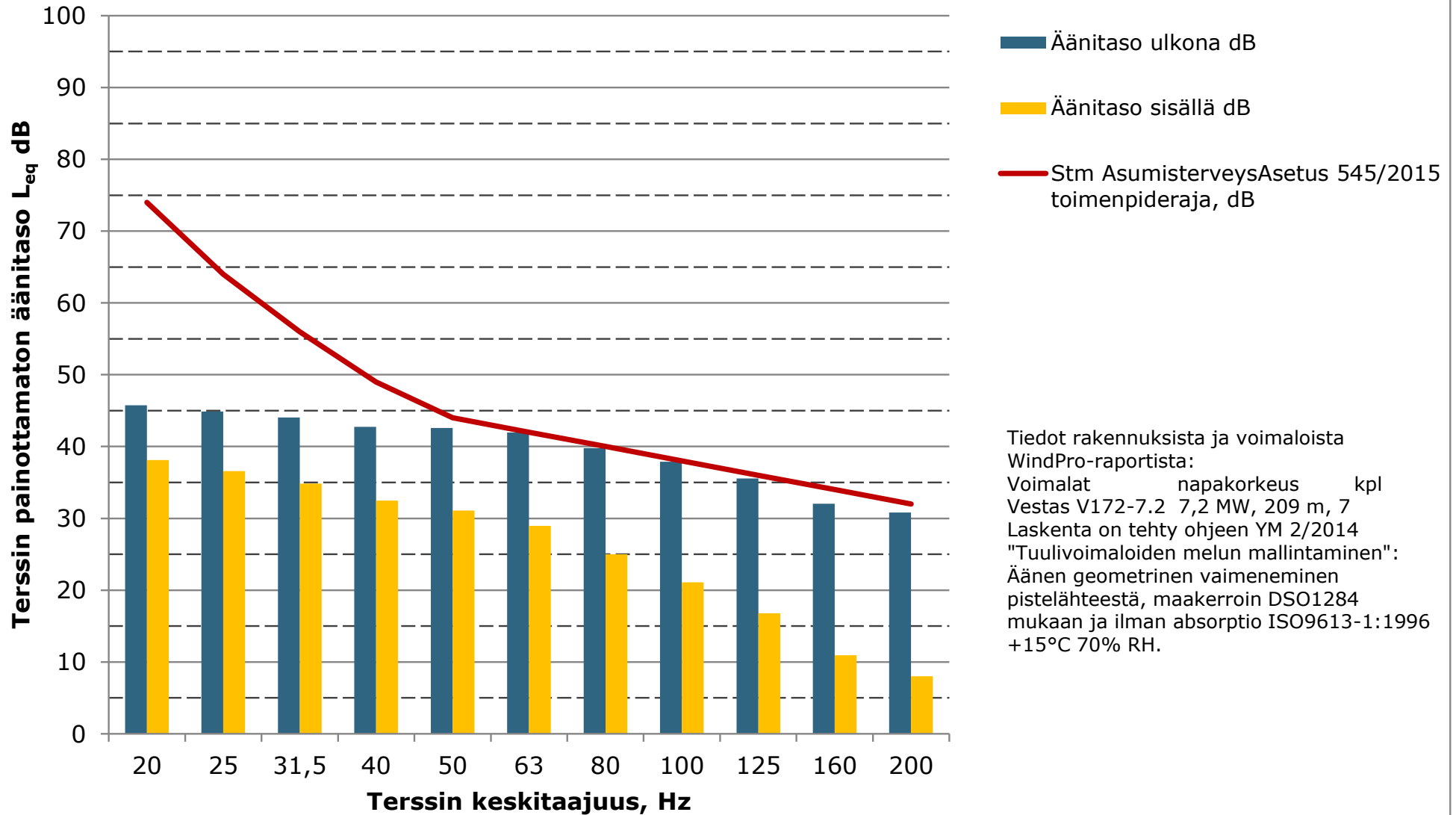




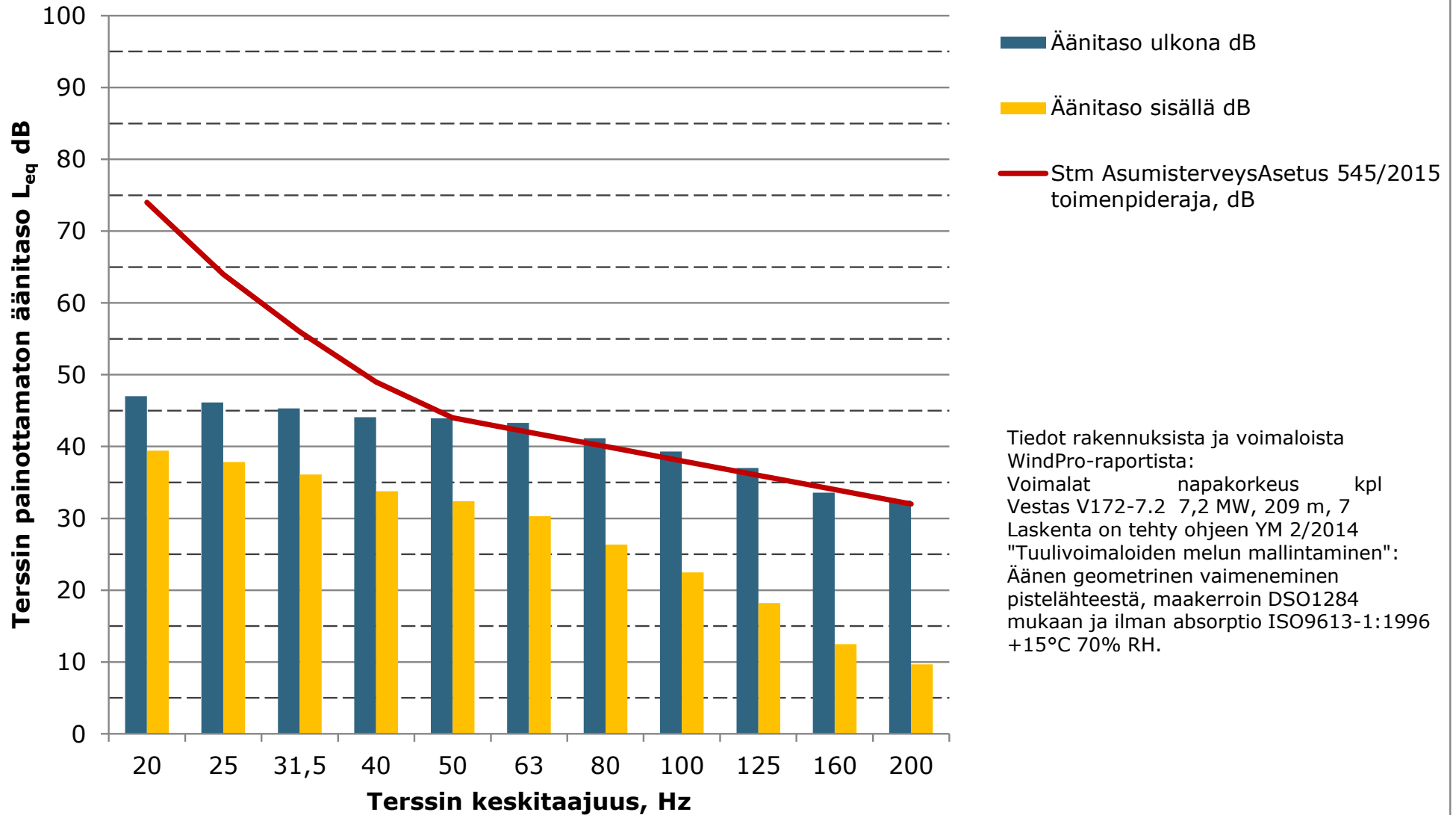
**Matalien taajuuksien äänitasot ulkona ja sisällä, A - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



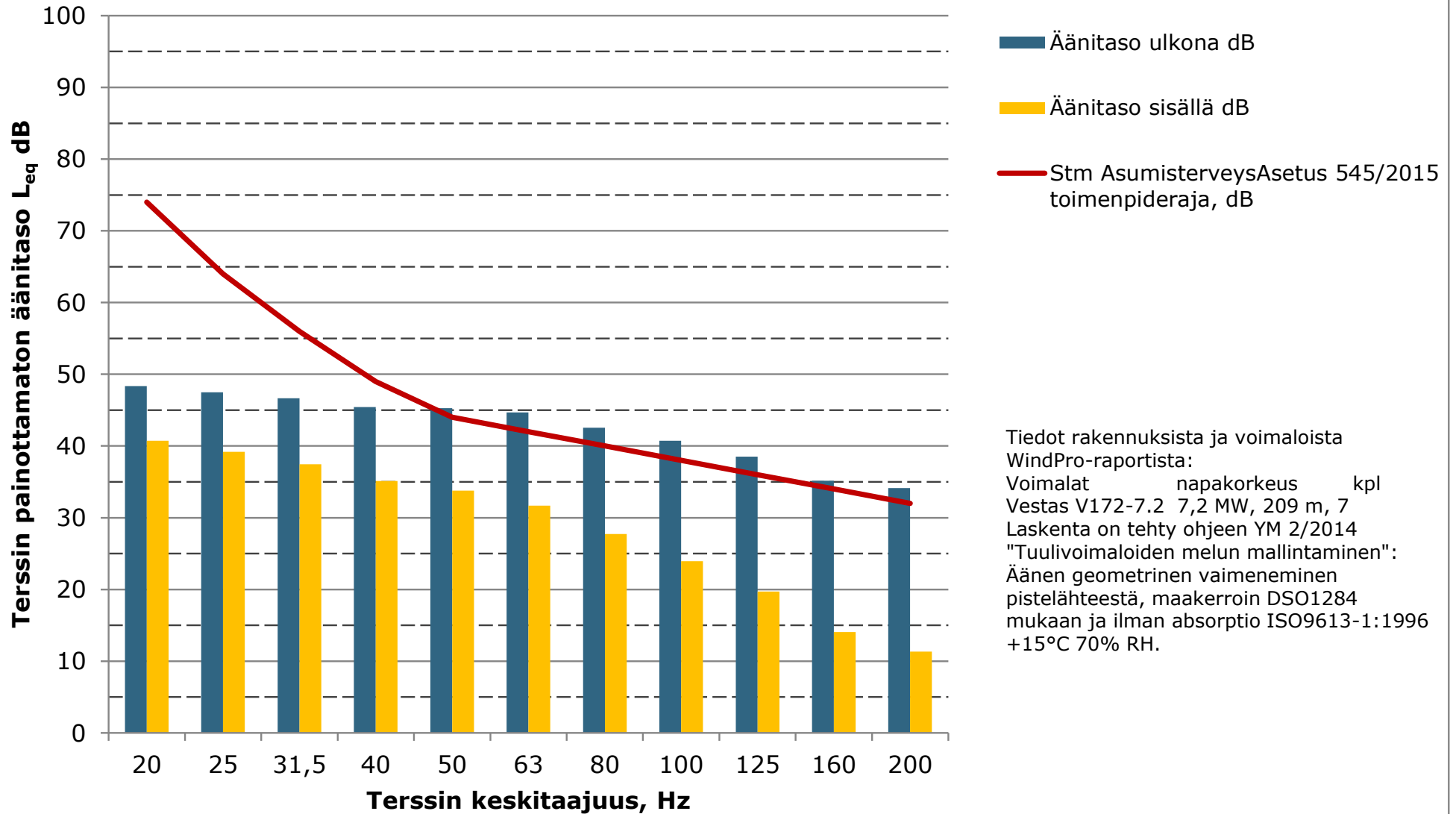
**Matalien taajuuksien äänitasot ulkona ja sisällä, B - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



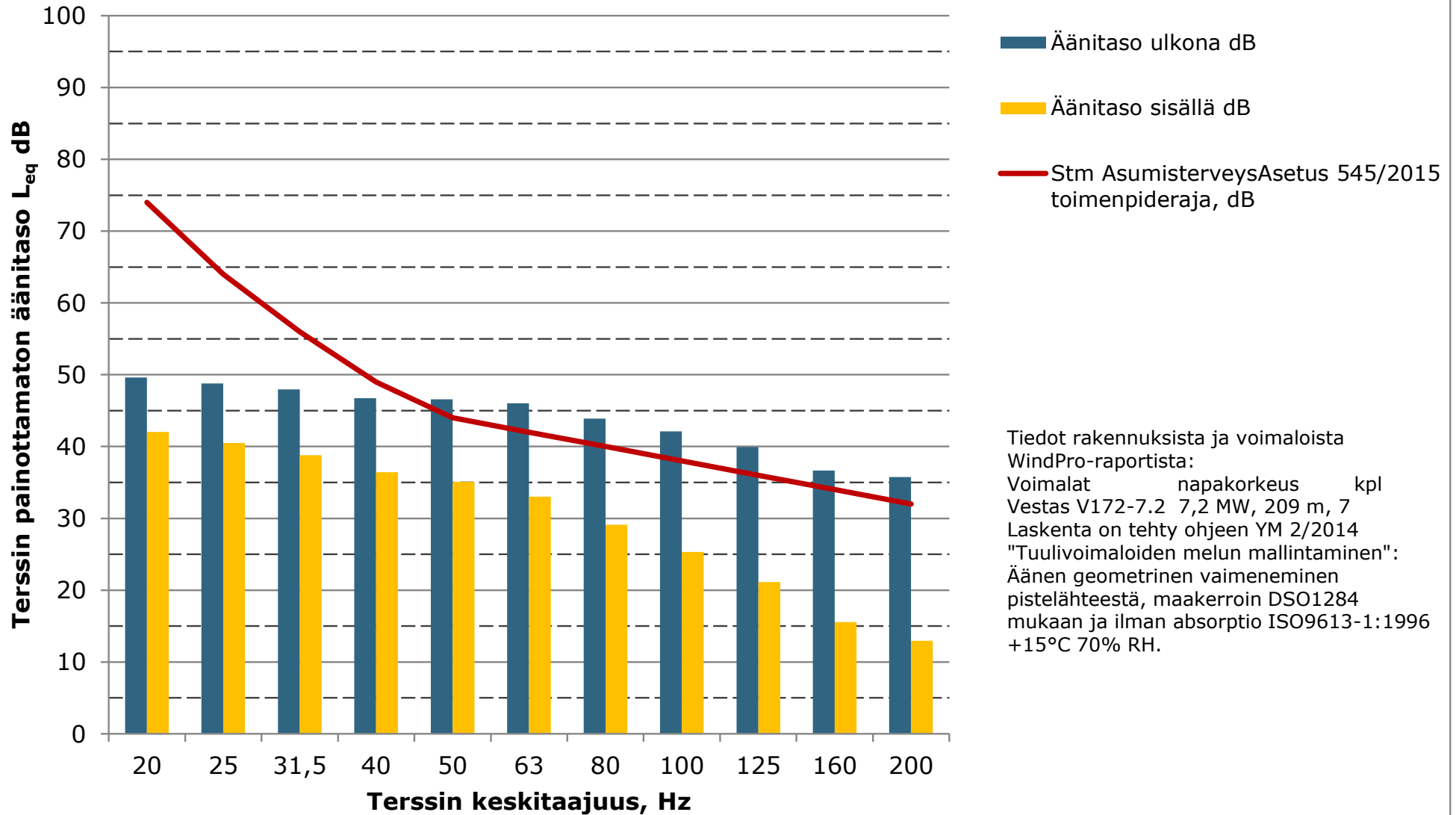
**Matalien taajuuksien äänitasot ulkona ja sisällä, C - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



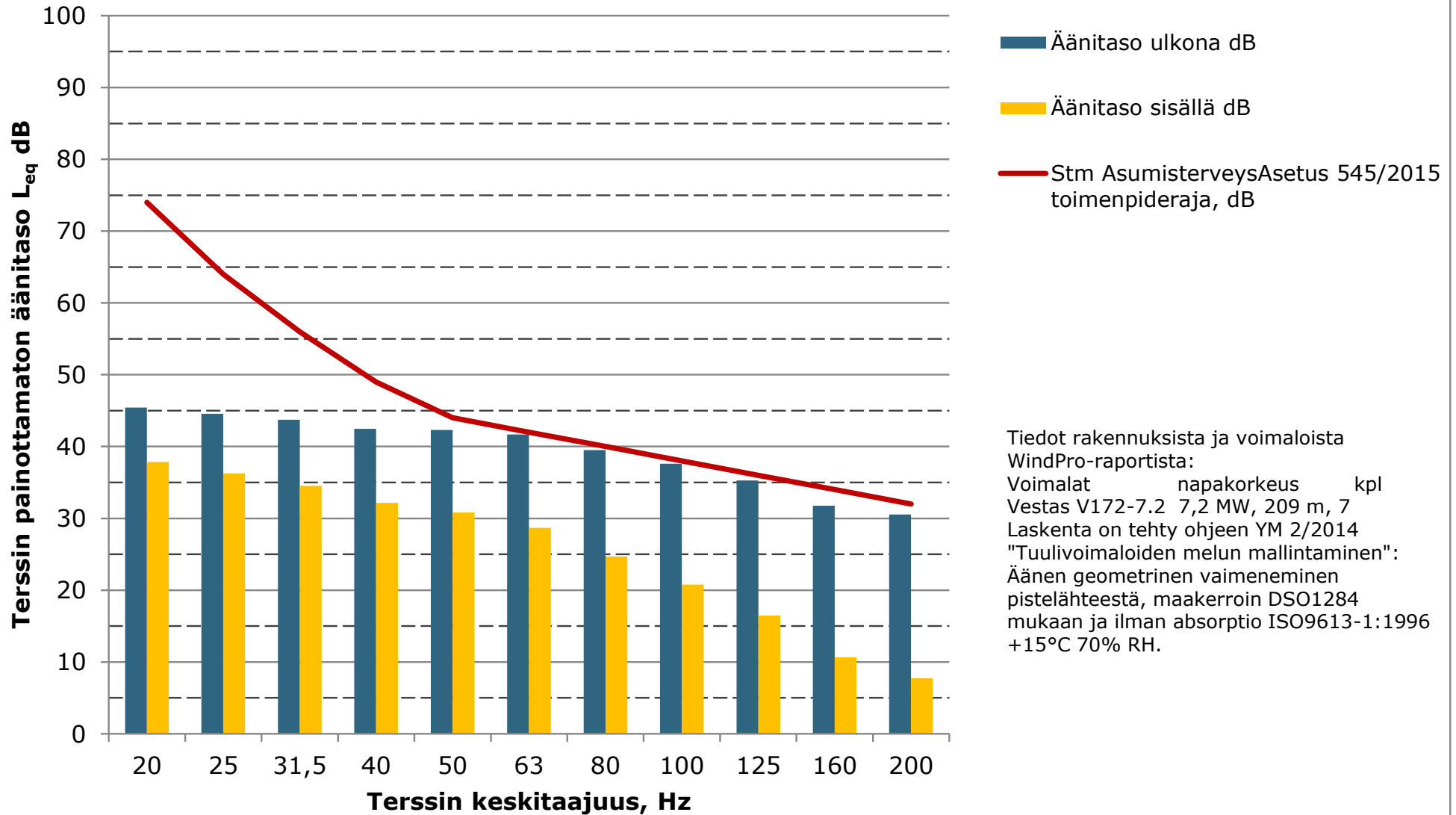
**Matalien taajuuksien äänitasot ulkona ja sisällä, D - Lomarakenus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



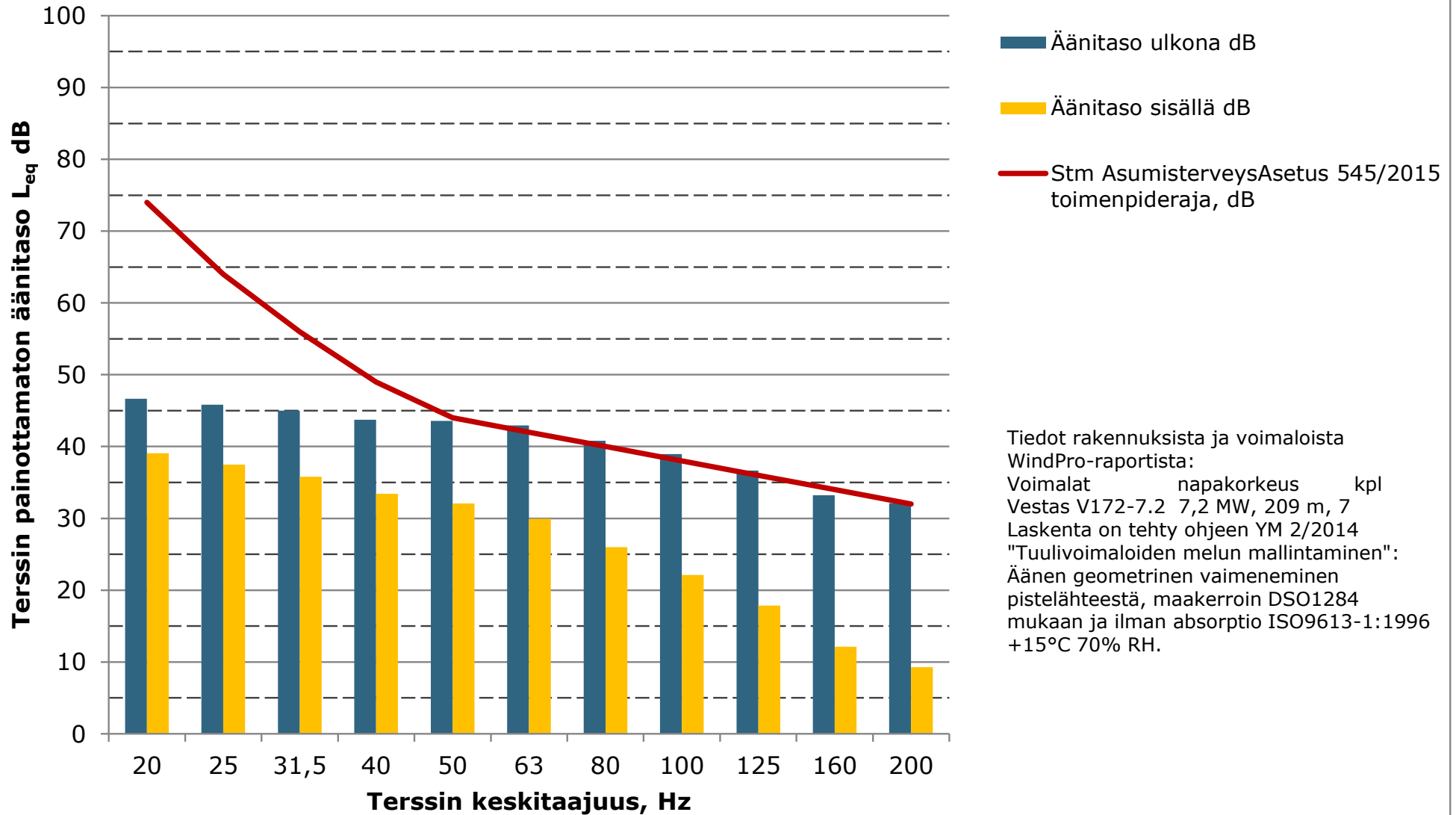
**Matalien taajuuksien äänitasot ulkona ja sisällä, E - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



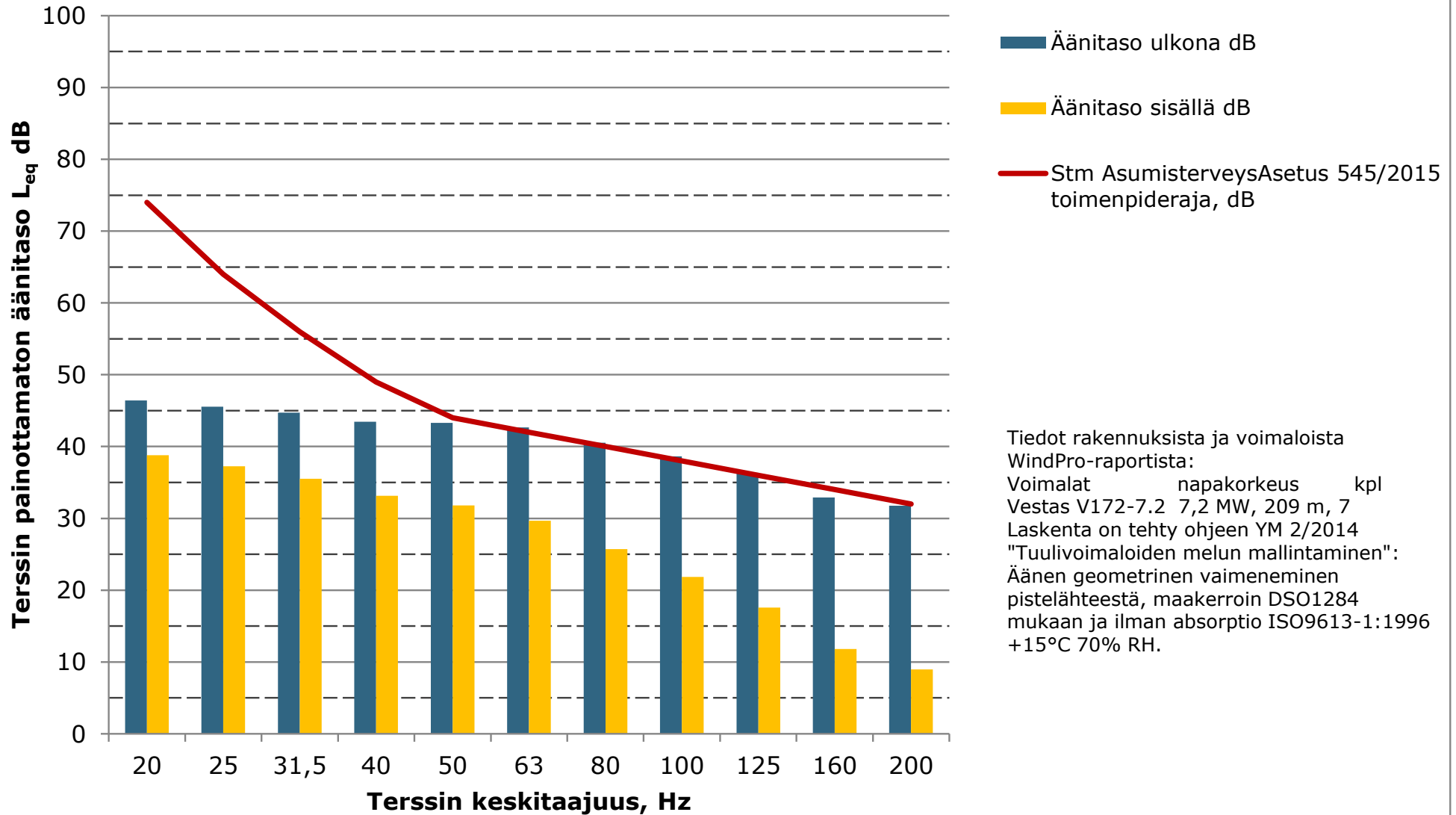
**Matalien taajuuksien äänitasot ulkona ja sisällä, F - Lomarakenus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



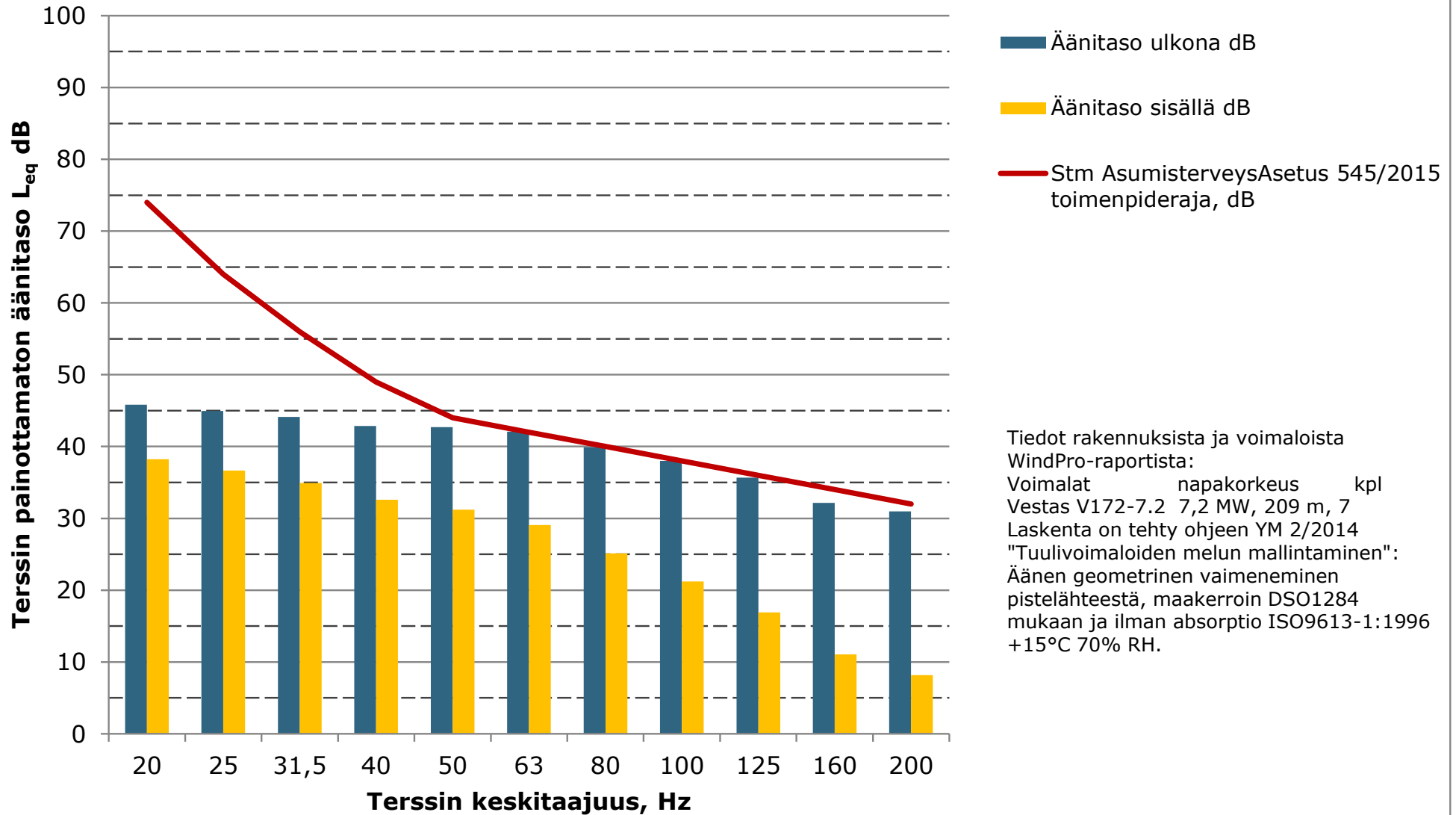
**Matalien taajuuksien äänitasot ulkona ja sisällä, G - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



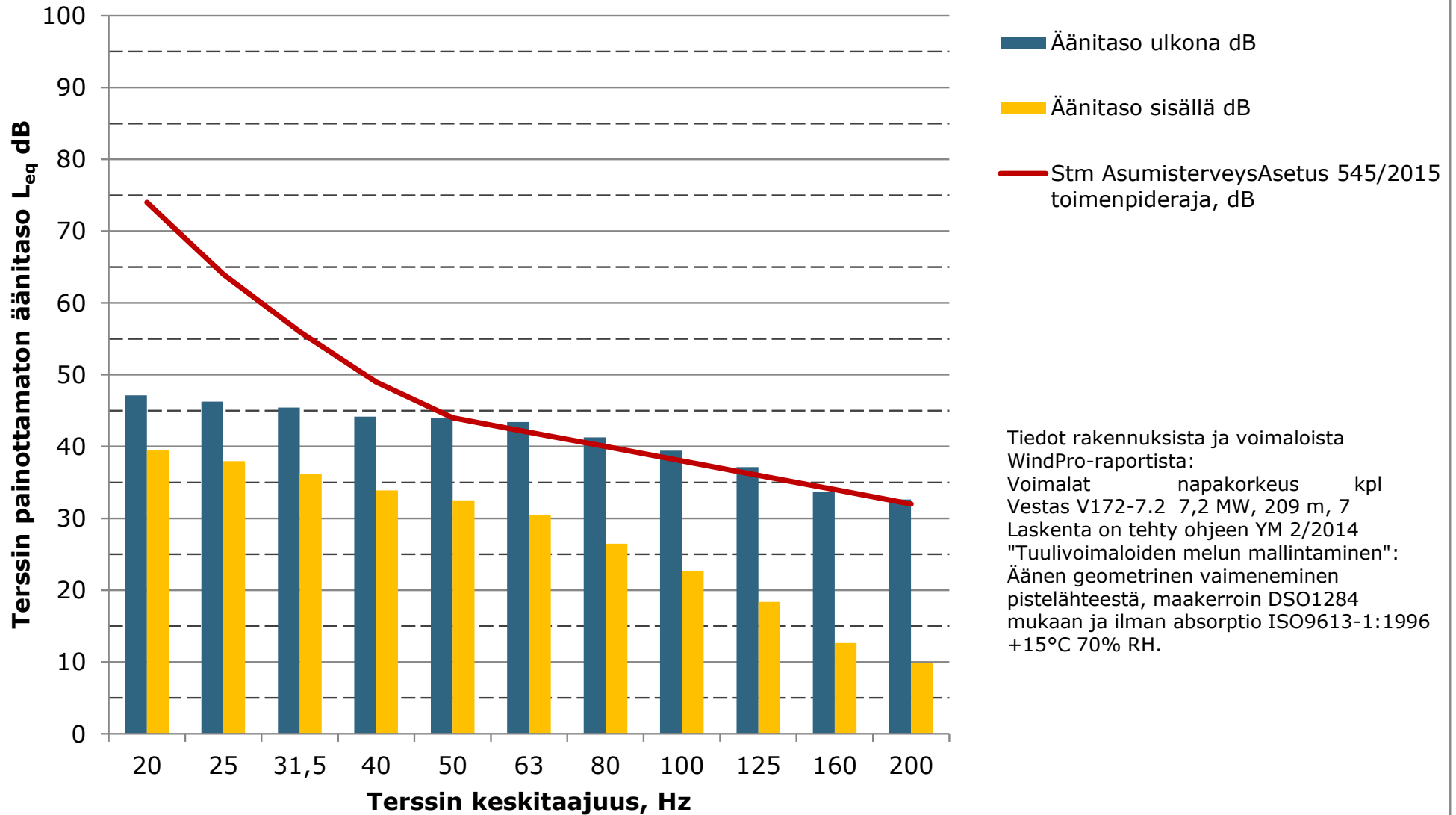
**Matalien taajuuksien äänitasot ulkona ja sisällä, H - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



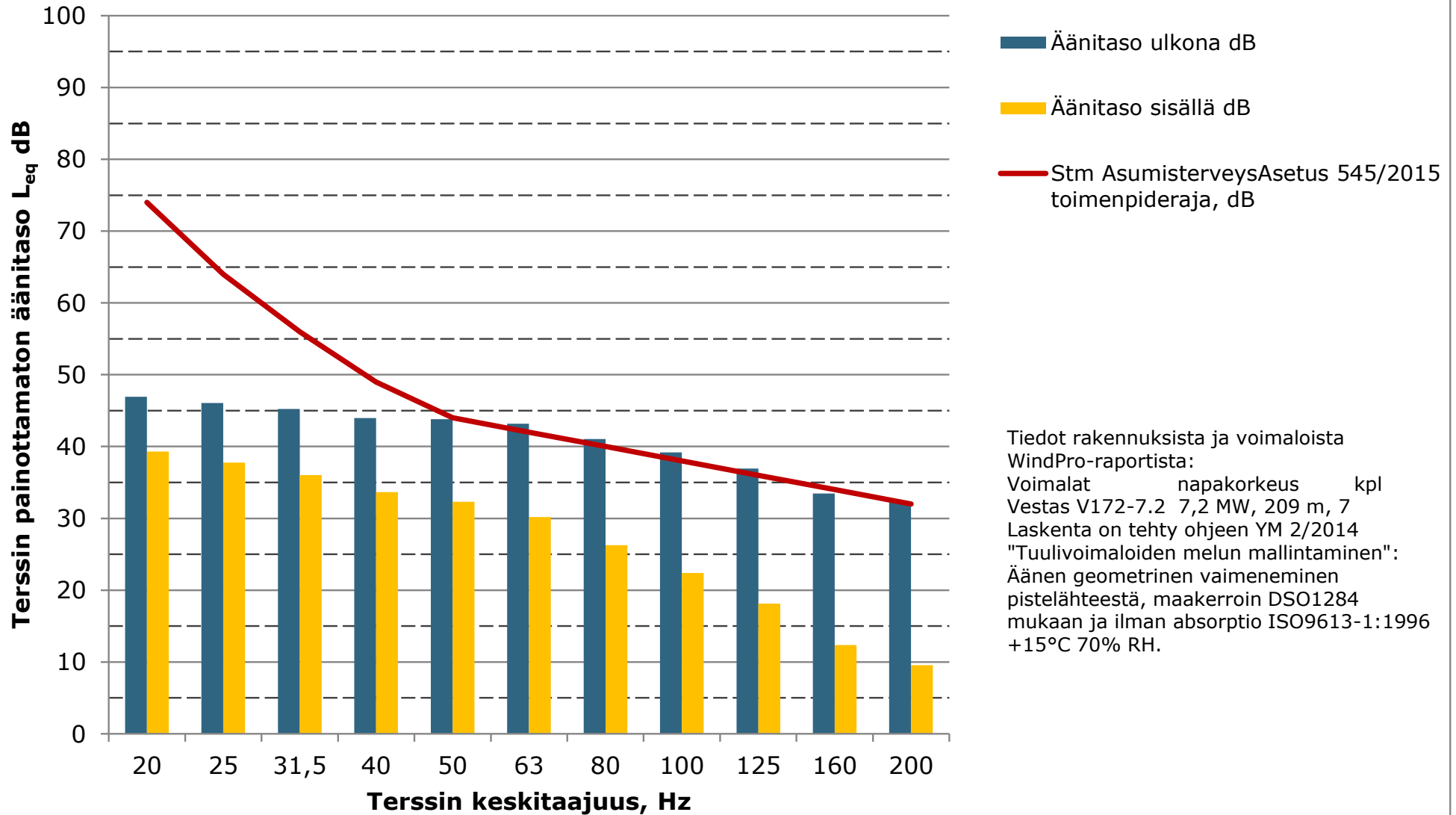
**Matalien taajuuksien äänitasot ulkona ja sisällä, I - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



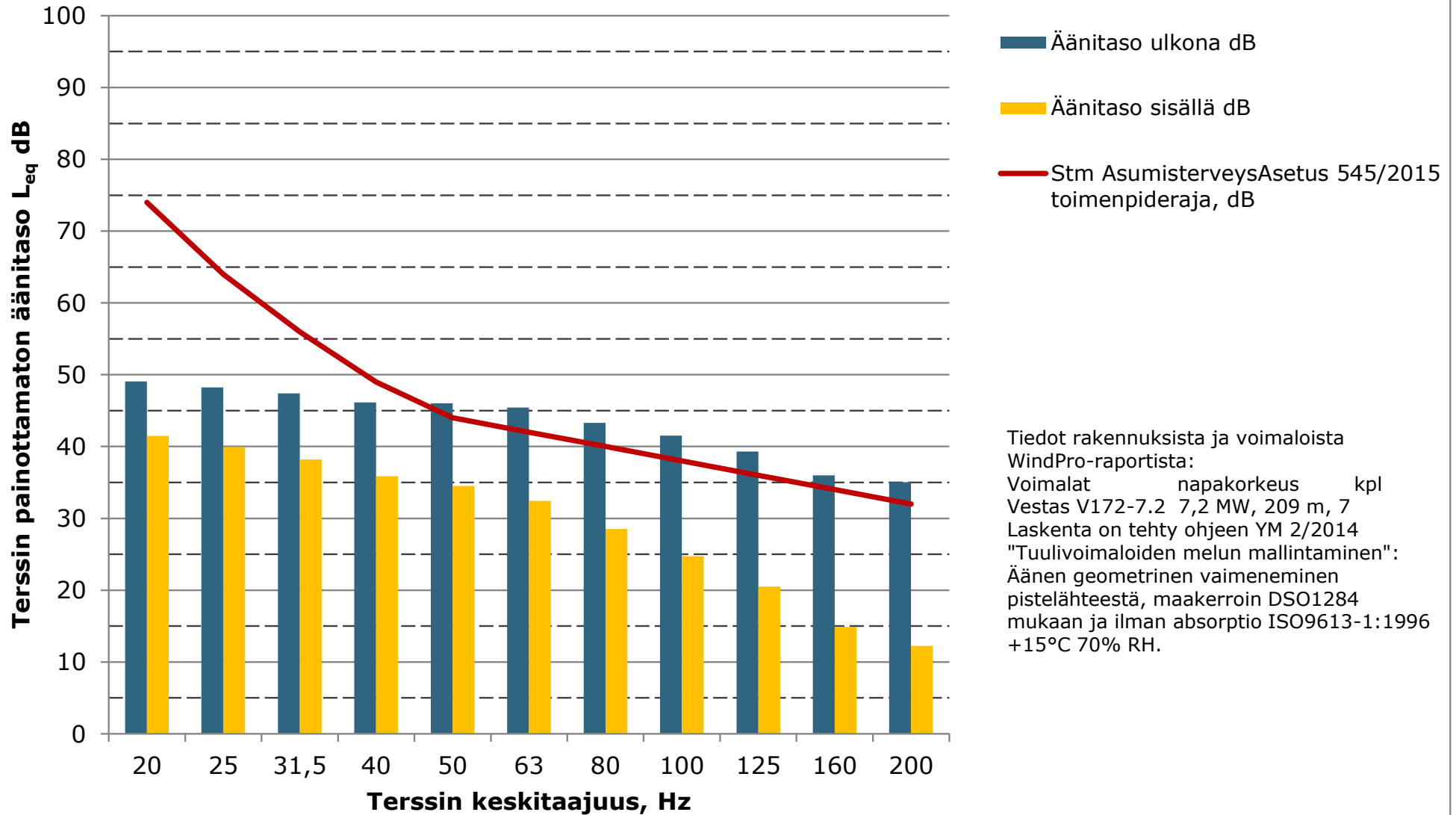
**Matalien taajuuksien äänitasot ulkona ja sisällä, J - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



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



**Matalien taajuuksien äänitasot ulkona ja sisällä, L - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



Bilaga 5. Skuggmodelleringens resultat "real case, no forest" - Projektalternativ ALT1

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_No_forest_291025

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) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
658	501	405	380	500	735	1 005	1 175	840	615	500	540	7 854

Monthly aggregation of real case reduction

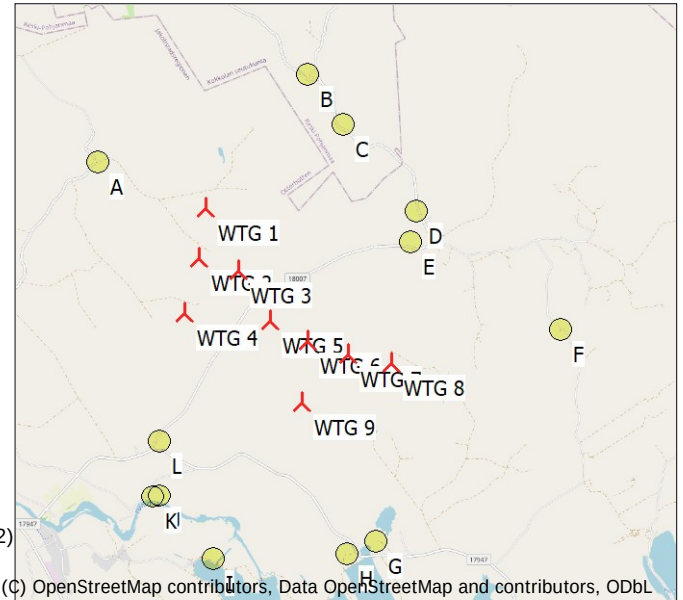
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

DHM: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)

Receptor grid resolution: 1,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89



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

Scale 1:100 000

▲ New WTG

● Shadow receptor

WTGs

	East	North	Z	Row data/Description	WTG type		Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.				Calculation distance [m]	RPM
			[m]								[RPM]
WTG 1	322 570	7 072 630	39,7	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 2	322 459	7 071 970	42,5	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 3	322 968	7 071 771	35,0	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 4	322 233	7 071 257	44,6	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 5	323 349	7 071 090	40,0	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 6	323 833	7 070 792	45,0	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 7	324 359	7 070 588	48,8	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 8	324 934	7 070 443	50,7	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 9	323 712	7 069 988	49,7	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5

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	A - Asuinrakennus	321 194	7 073 316	32,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	B - Asuinrakennus	324 024	7 074 328	24,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	C - Asuinrakennus	324 459	7 073 641	29,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	D - Lomarakenus	325 375	7 072 435	30,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	E - Asuinrakennus	325 275	7 072 032	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	F - Lomarakenus	327 197	7 070 758	47,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	G - Asuinrakennus	324 595	7 068 088	51,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	H - Asuinrakennus	324 203	7 067 934	55,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	I - Asuinrakennus	322 423	7 067 969	42,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	J - Asuinrakennus	321 755	7 068 860	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	K - Asuinrakennus	321 664	7 068 837	33,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	L - Asuinrakennus	321 791	7 069 585	50,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_No_forest_291025

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours per year [h/year]
A	A - Asuinrakennus	5:04
B	B - Asuinrakennus	0:00
C	C - Asuinrakennus	0:00
D	D - Lomarakenus	2:19
E	E - Asuinrakennus	8:22
F	F - Lomarakenus	0:00
G	G - Asuinrakennus	0:00
H	H - Asuinrakennus	0:00
I	I - Asuinrakennus	0:00
J	J - Asuinrakennus	0:00
K	K - Asuinrakennus	0:00
L	L - Asuinrakennus	2:01

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

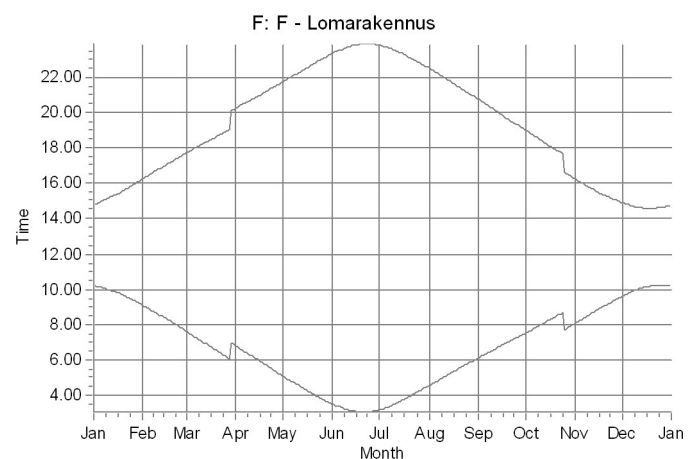
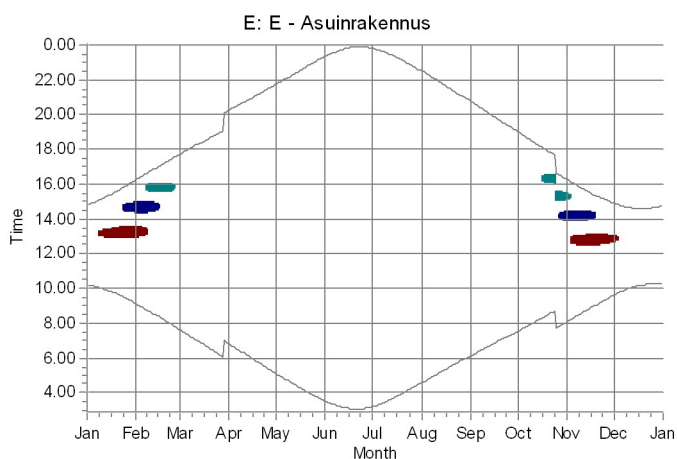
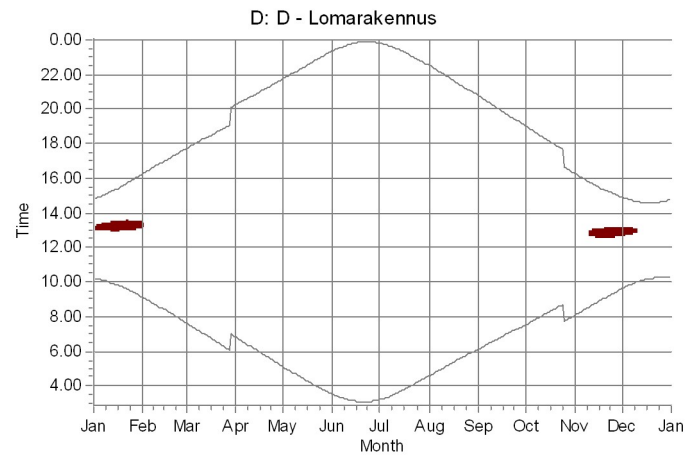
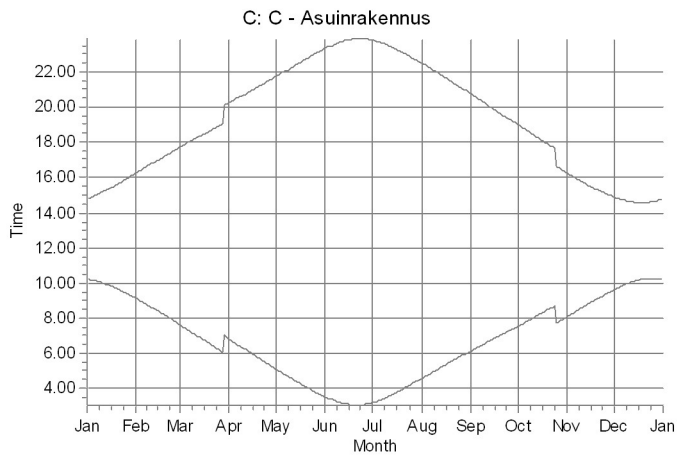
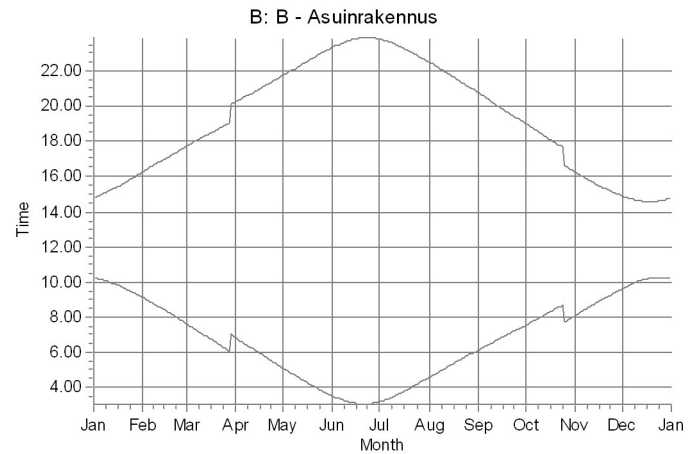
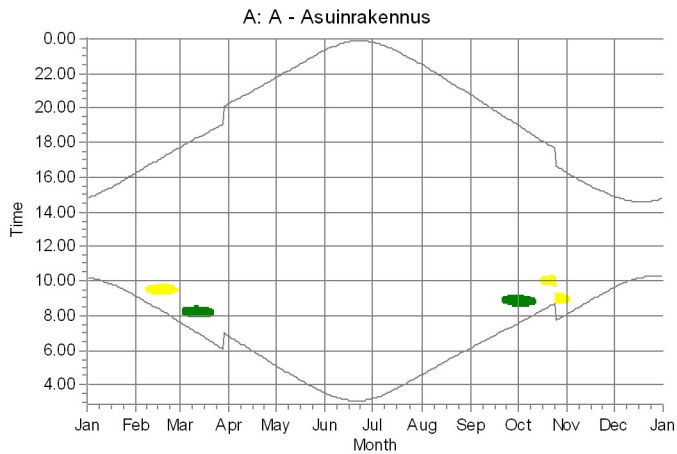
No.	Name	Expected [h/year]
WTG 1	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (482)	2:44
WTG 2	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (481)	2:20
WTG 3	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (480)	0:00
WTG 4	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (483)	0:00
WTG 5	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (485)	0:00
WTG 6	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (484)	2:12
WTG 7	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (486)	2:49
WTG 8	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (488)	3:44
WTG 9	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (487)	2:01

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: VE1_Jolkka_RD200x9xHH195_No_forest_291025



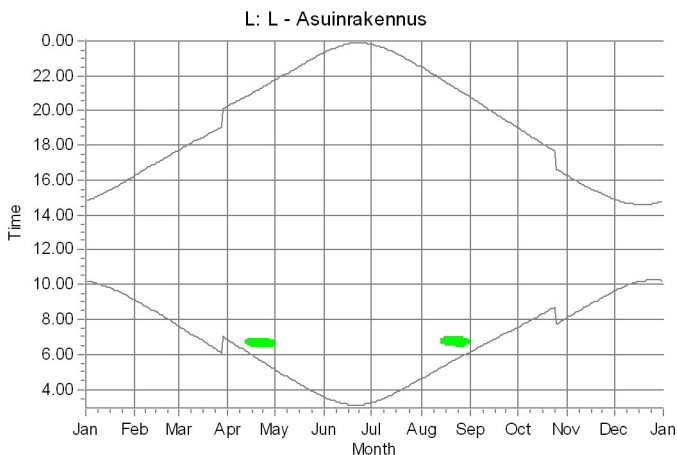
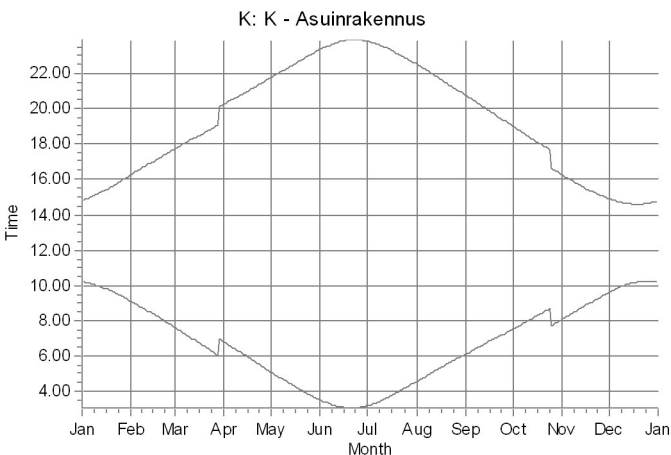
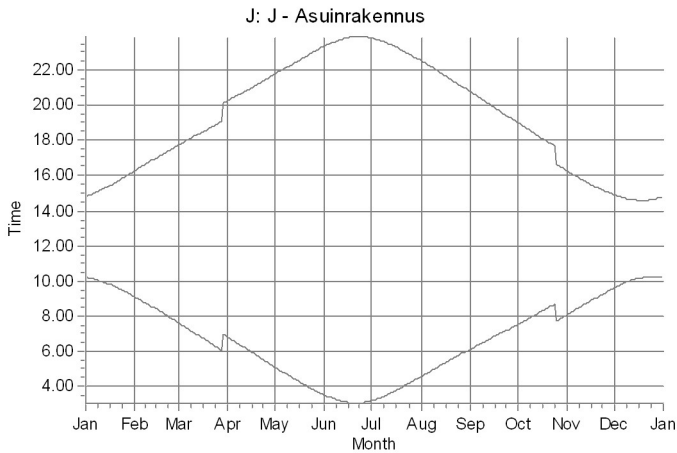
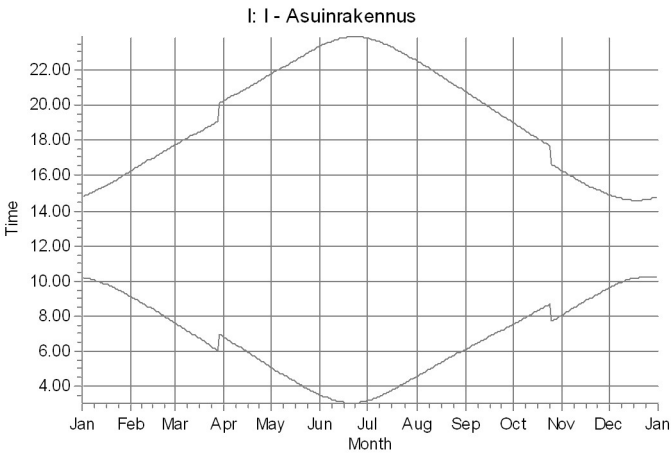
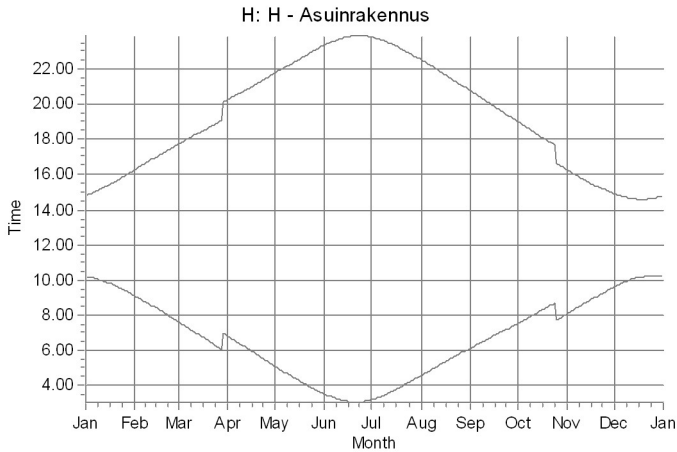
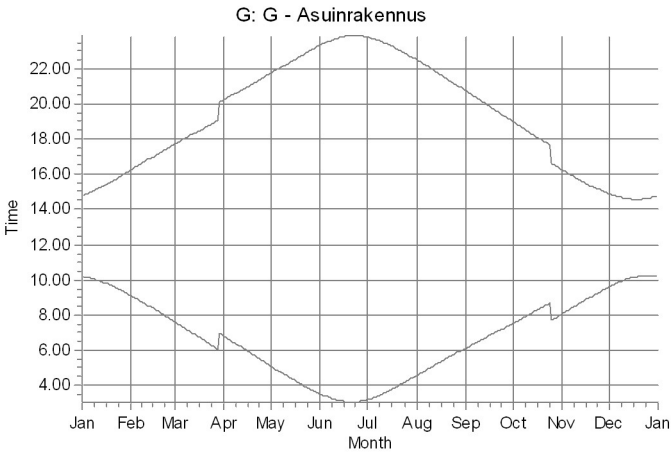
WTGs

- WTG 1: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (482)
- WTG 2: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (481)
- WTG 6: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (484)

- WTG 7: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (486)
- WTG 8: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (488)

SHADOW - Calendar, graphical

Calculation: VE1_Jolkka_RD200x9xHH195_No_forest_291025

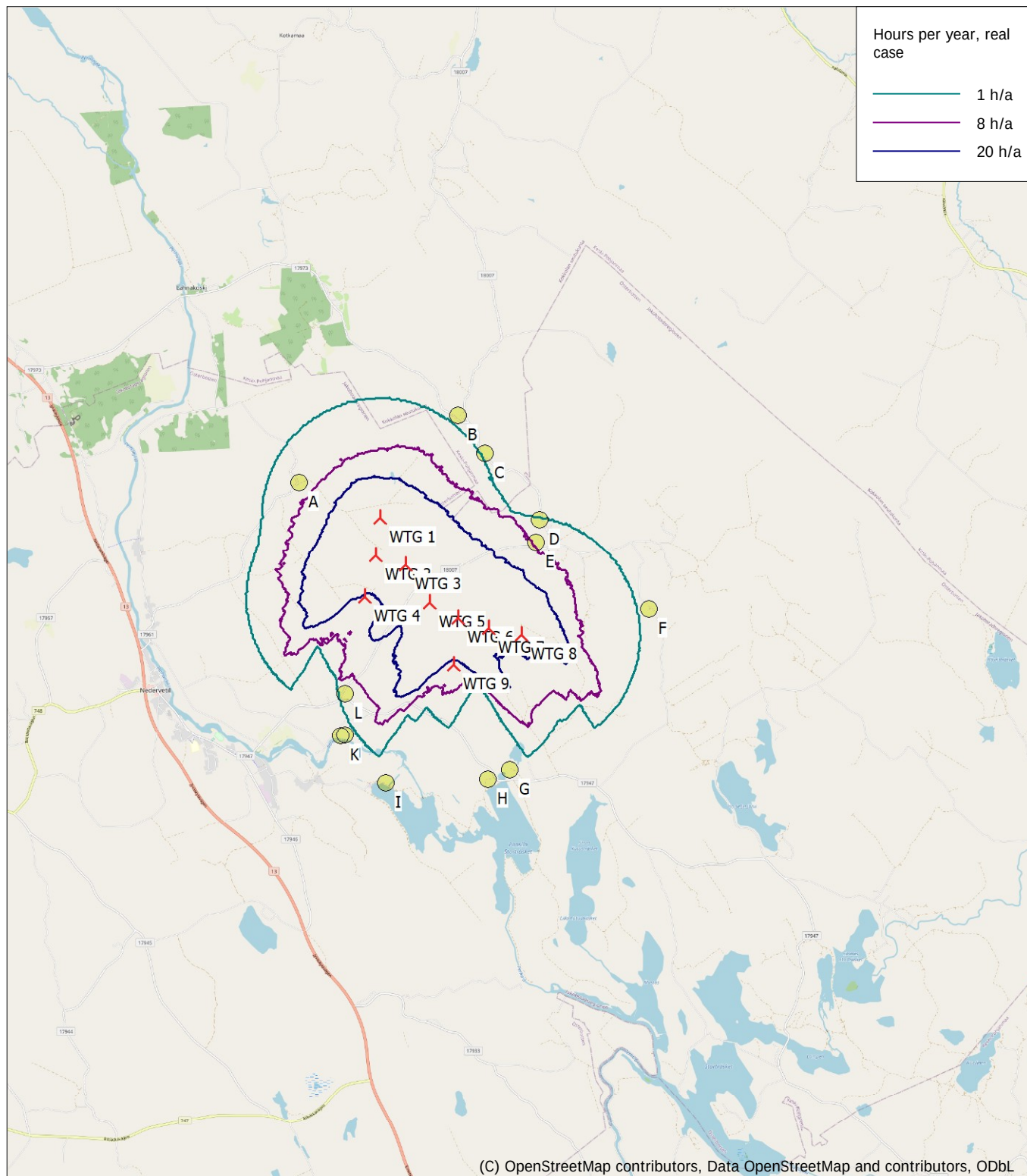


WTGs

WTG 9: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (487)

SHADOW - Map

Calculation: VE1_Jolkka_RD200x9xHH195_No_forest_291025



Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 324 510 North: 7 070 910
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 6. Skuggmodelleringens resultat "real case, luke forest" - Projektalternativ ALT1

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henri Korhonen / henri.korhonen@fcg.fi
Calculated:
29.10.2025 13.10/4.1.273

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Luke_forest_291025

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) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
658	501	405	380	500	735	1 005	1 175	840	615	500	540	7 854

Monthly aggregation of real case reduction

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:

DHM: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)

Land cover data used in calculation:

Area object(s):

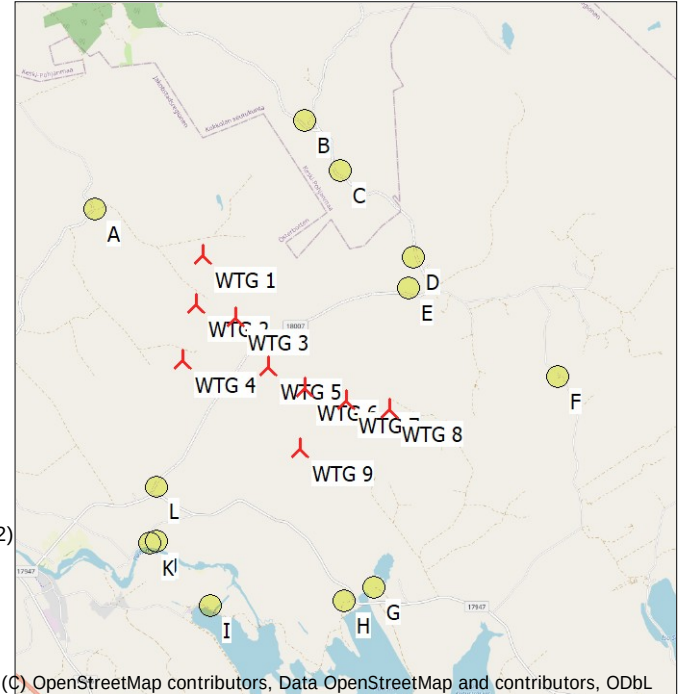
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI

obstructions): REGIONS_Jolkka_meluvälkemallinnus_jk_0.w2r (5)

Receptor grid resolution: 1,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89



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

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
			[m]									[RPM]
WTG 1	322 570	7 072 630	39,7	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 2	322 459	7 071 970	42,5	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 3	322 968	7 071 771	35,0	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 4	322 233	7 071 257	44,6	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 5	323 349	7 071 090	40,0	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 6	323 833	7 070 792	45,0	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 7	324 359	7 070 588	48,8	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 8	324 934	7 070 443	50,7	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 9	323 712	7 069 988	49,7	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5

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	A - Asuinrakennus	321 194	7 073 316	32,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	B - Asuinrakennus	324 024	7 074 328	24,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	C - Asuinrakennus	324 459	7 073 641	29,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	D - Lomarakennus	325 375	7 072 435	30,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	E - Asuinrakennus	325 275	7 072 032	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	F - Lomarakennus	327 197	7 070 758	47,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	G - Asuinrakennus	324 595	7 068 088	51,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	H - Asuinrakennus	324 203	7 067 934	55,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	I - Asuinrakennus	322 423	7 067 969	42,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	J - Asuinrakennus	321 755	7 068 860	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	K - Asuinrakennus	321 664	7 068 837	33,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	L - Asuinrakennus	321 791	7 069 585	50,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henri Korhonen / henri.korhonen@fcg.fi
Calculated:
29.10.2025 13.10/4.1.273

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Luke_forest_291025

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours per year [h/year]
A	A - Asuinrakennus	5:04
B	B - Asuinrakennus	0:00
C	C - Asuinrakennus	0:00
D	D - Lomarakenus	2:19
E	E - Asuinrakennus	5:02
F	F - Lomarakenus	0:00
G	G - Asuinrakennus	0:00
H	H - Asuinrakennus	0:00
I	I - Asuinrakennus	0:00
J	J - Asuinrakennus	0:00
K	K - Asuinrakennus	0:00
L	L - Asuinrakennus	2:01

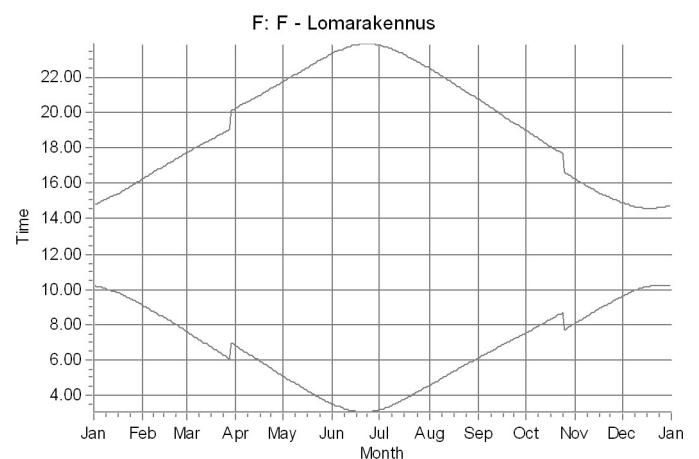
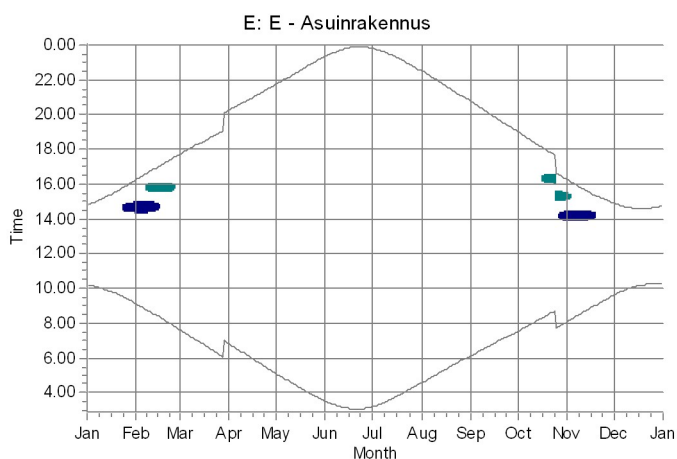
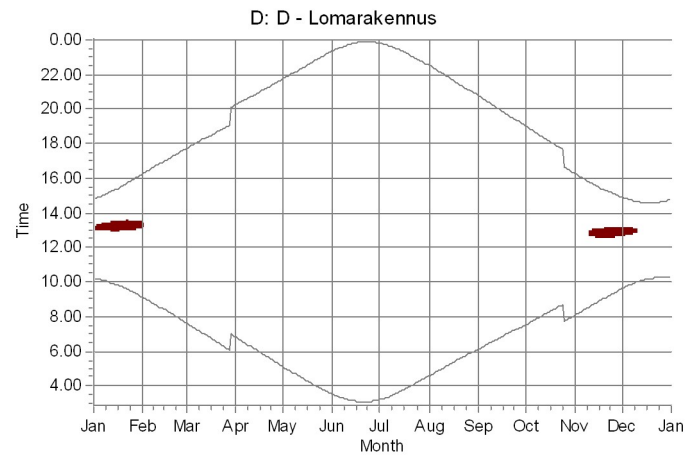
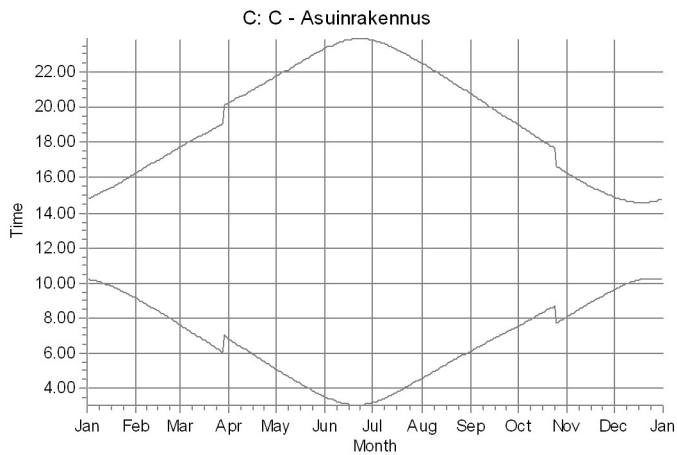
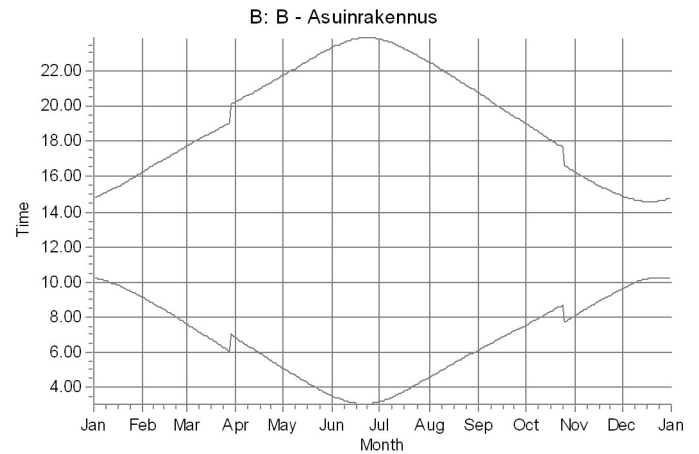
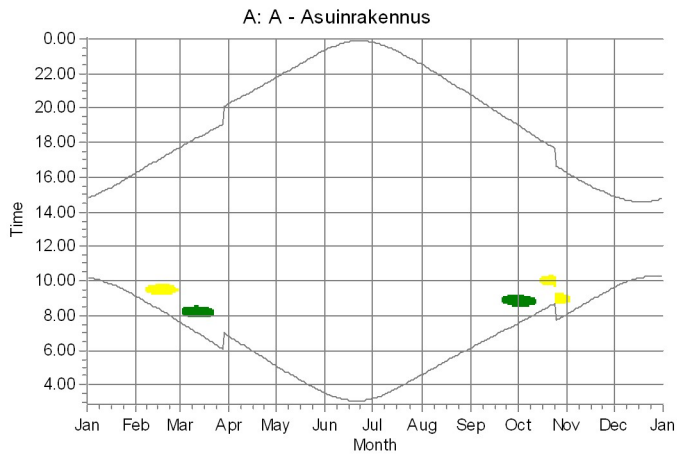
Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
WTG 1	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (482)	2:44
WTG 2	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (481)	2:20
WTG 3	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (480)	0:00
WTG 4	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (483)	0:00
WTG 5	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (485)	0:00
WTG 6	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (484)	2:12
WTG 7	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (486)	2:49
WTG 8	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (488)	2:19
WTG 9	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (487)	2:01

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: VE1_Jolkka_RD200x9xHH195_Luke_forest_291025



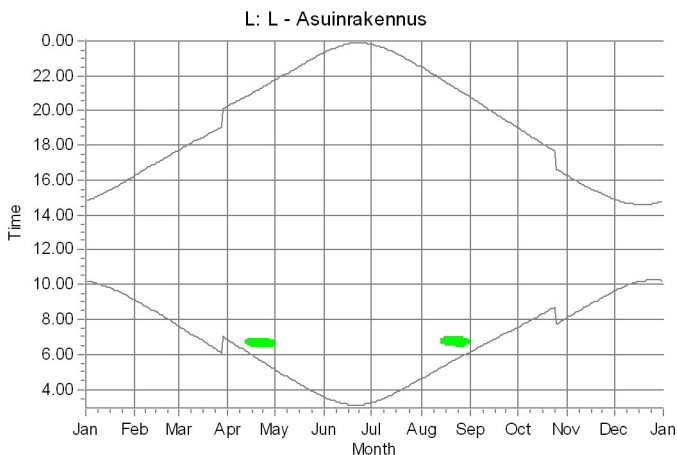
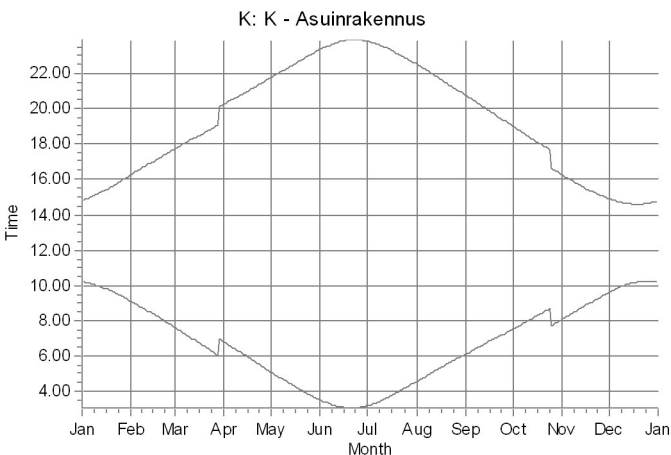
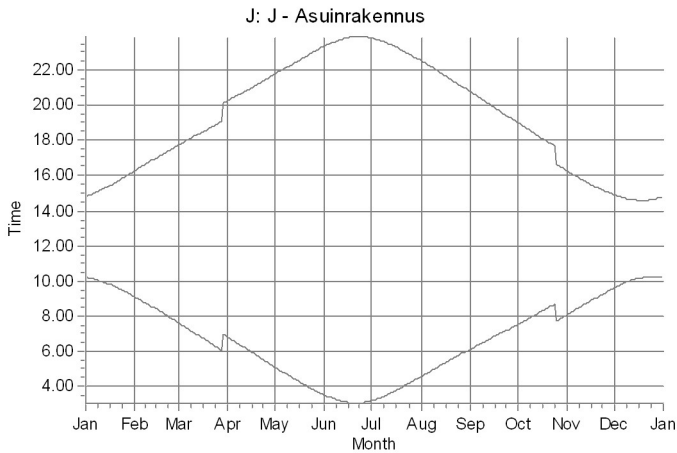
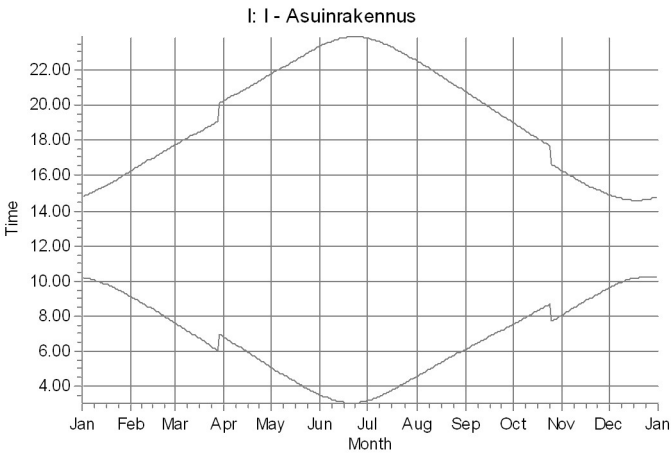
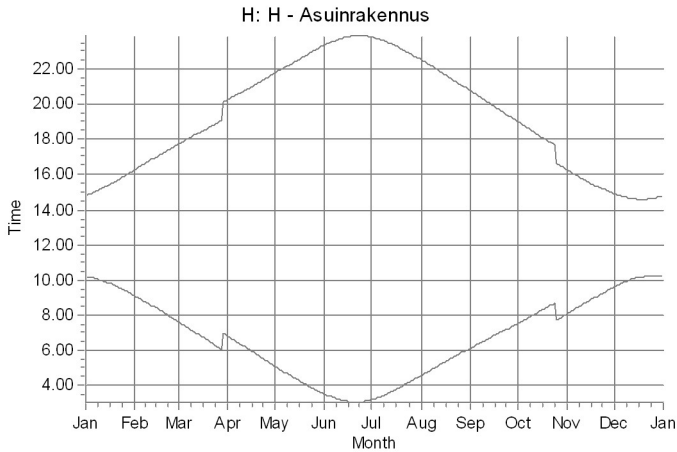
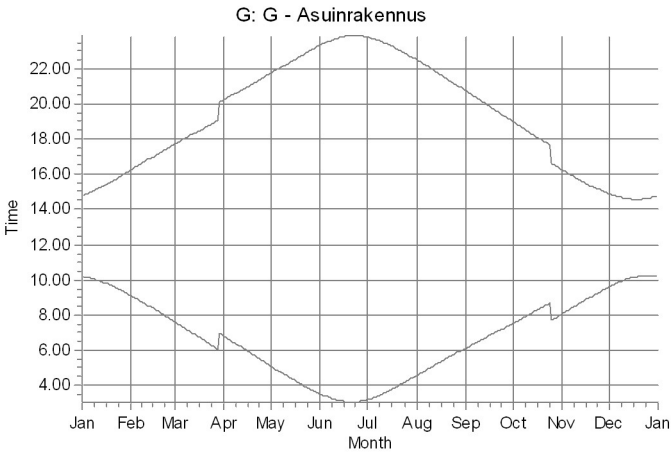
WTGs

- WTG 1: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (482)
- WTG 2: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (481)
- WTG 6: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (484)

- WTG 7: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (486)
- WTG 8: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (488)

SHADOW - Calendar, graphical

Calculation: VE1_Jolkka_RD200x9xHH195_Luke_forest_291025

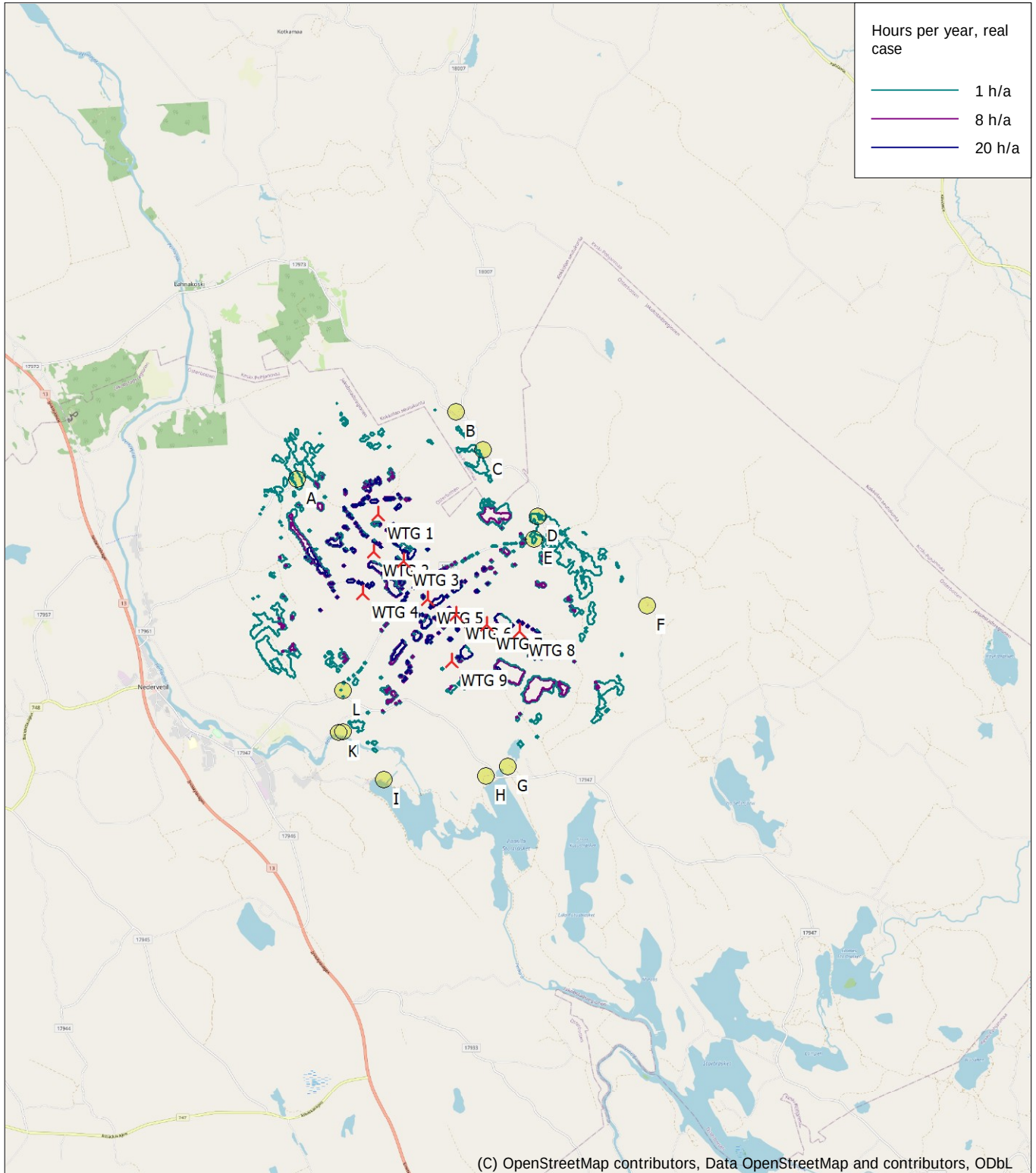


WTGs

WTG 9: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (487)

SHADOW - Map

Calculation: VE1_Jolkka_RD200x9xHH195_Luke_forest_291025



Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 324 510 North: 7 070 910
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 7. Skuggmodelleringens resultat "real case, no forest" - Projektalternativ ALT2

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_No_forest_291025

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) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
658	501	405	380	500	735	1 005	1 175	840	615	500	540	7 854

Monthly aggregation of real case reduction

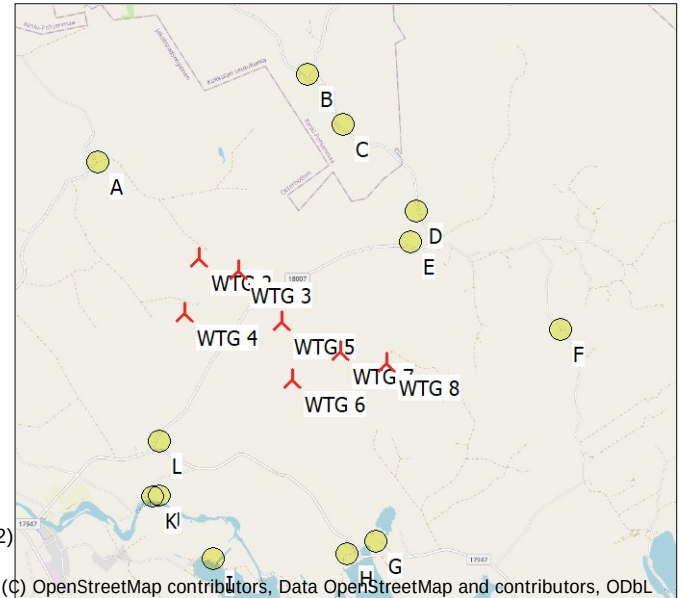
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

DHM: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)

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.				Calculation distance [m]	RPM
			[m]								[RPM]
WTG 2	322 459	7 071 970	42,5	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 3	322 968	7 071 771	35,0	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 4	322 233	7 071 257	44,6	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 5	323 504	7 071 059	45,0	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 6	323 609	7 070 303	45,5	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 7	324 270	7 070 629	45,0	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 8	324 869	7 070 455	48,0	Generic RD200 7200 200.0 !O! ...Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5

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	A - Asuinrakennus	321 194	7 073 316	32,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	B - Asuinrakennus	324 024	7 074 328	24,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	C - Asuinrakennus	324 459	7 073 641	29,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	D - Lomarakenus	325 375	7 072 435	30,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	E - Asuinrakennus	325 275	7 072 032	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	F - Lomarakenus	327 197	7 070 758	47,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	G - Asuinrakennus	324 595	7 068 088	51,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	H - Asuinrakennus	324 203	7 067 934	55,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	I - Asuinrakennus	322 423	7 067 969	42,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	J - Asuinrakennus	321 755	7 068 860	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	K - Asuinrakennus	321 664	7 068 837	33,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	L - Asuinrakennus	321 791	7 069 585	50,0	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	A - Asuinrakennus	2:20

To be continued on next page...

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henri Korhonen / henri.korhonen@fcg.fi
Calculated:
29.10.2025 9.52/4.1.273

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_No_forest_291025

...continued from previous page

No.	Name	Shadow, expected values
		Shadow hours per year [h/year]
B	B - Asuinrakennus	0:00
C	C - Asuinrakennus	0:00
D	D - Lomarakenus	2:17
E	E - Asuinrakennus	7:51
F	F - Lomarakenus	0:00
G	G - Asuinrakennus	0:00
H	H - Asuinrakennus	0:00
I	I - Asuinrakennus	0:00
J	J - Asuinrakennus	0:00
K	K - Asuinrakennus	0:00
L	L - Asuinrakennus	2:44

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

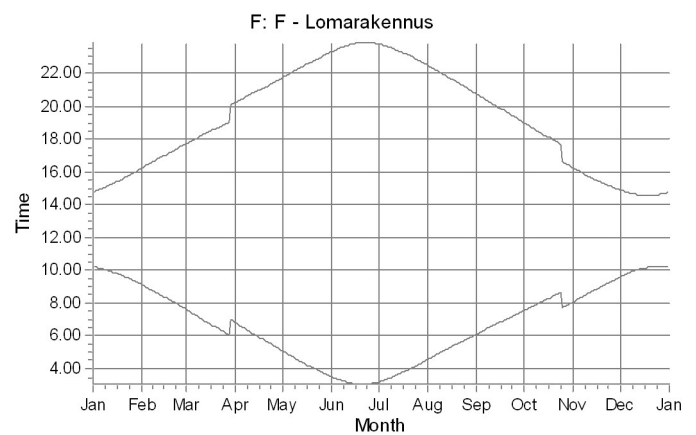
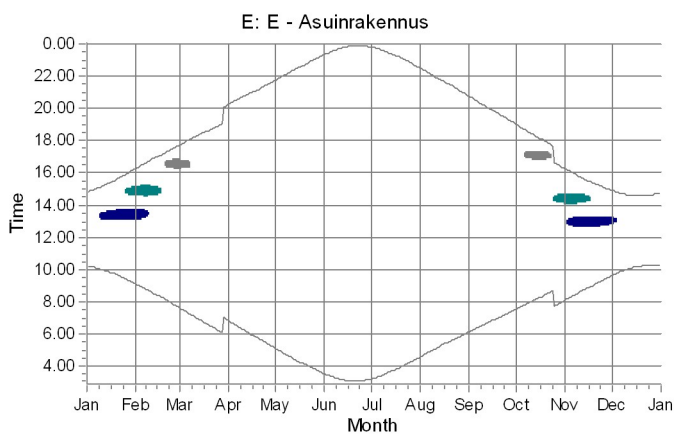
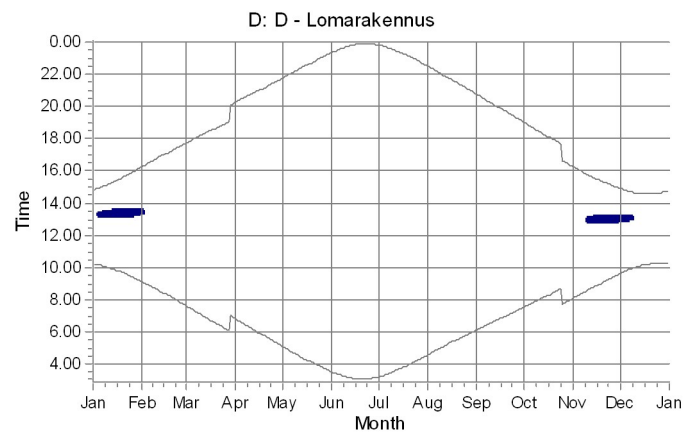
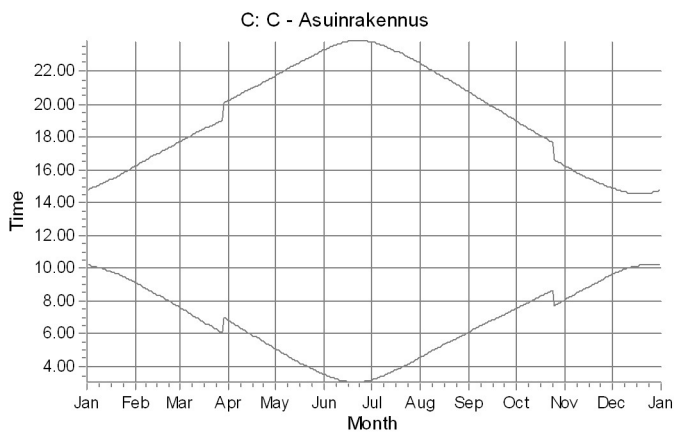
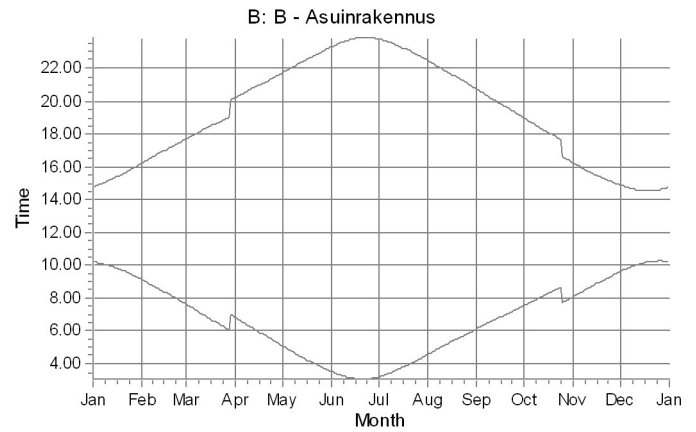
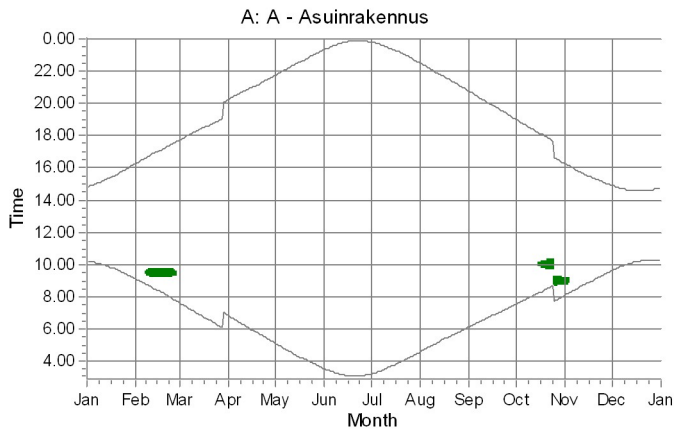
No.	Name	Expected [h/year]
WTG 2	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (490)	2:20
WTG 3	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (489)	0:00
WTG 4	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (491)	0:00
WTG 5	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (493)	1:47
WTG 6	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (492)	2:44
WTG 7	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (494)	2:47
WTG 8	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (495)	3:39

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

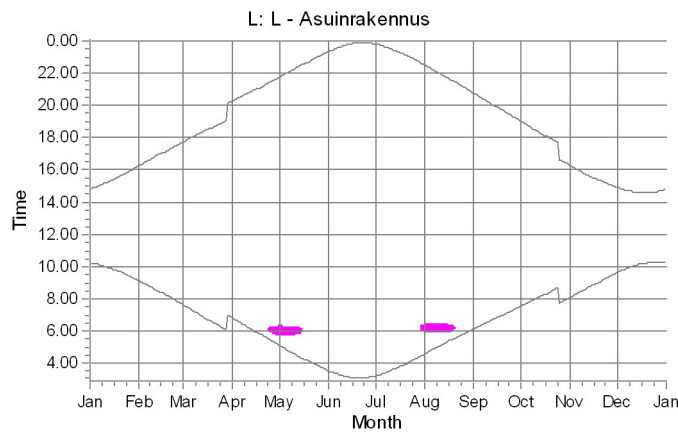
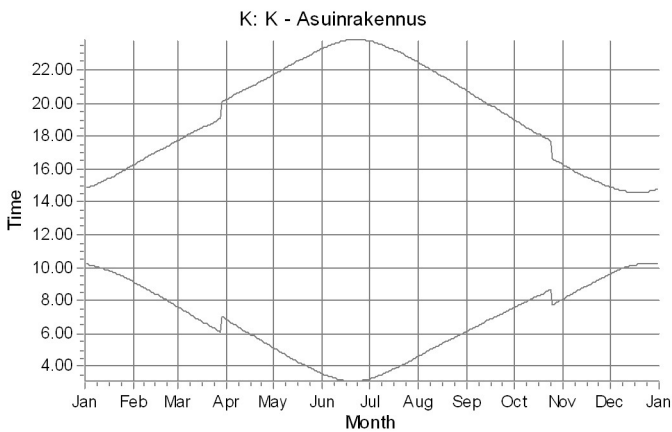
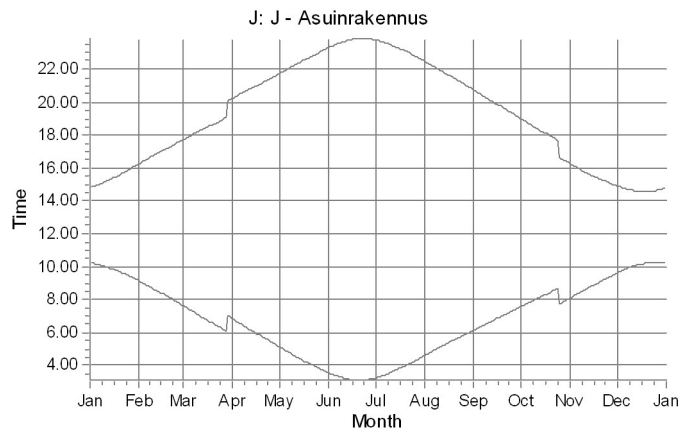
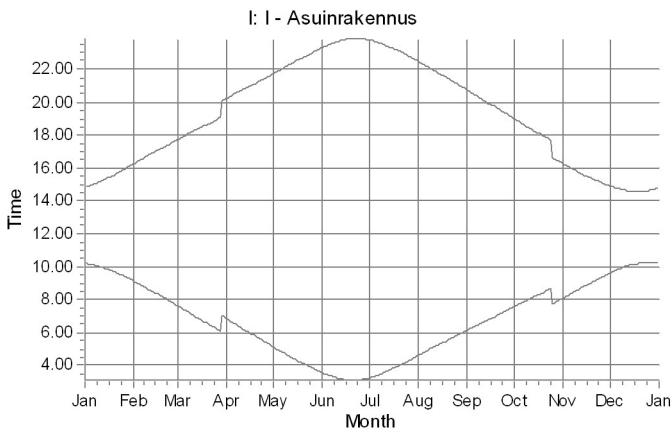
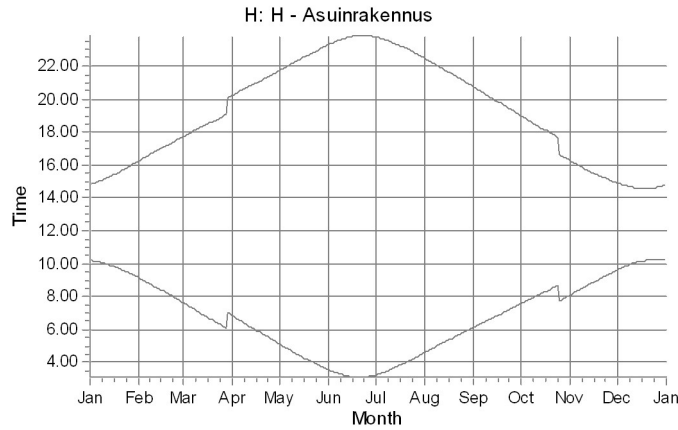
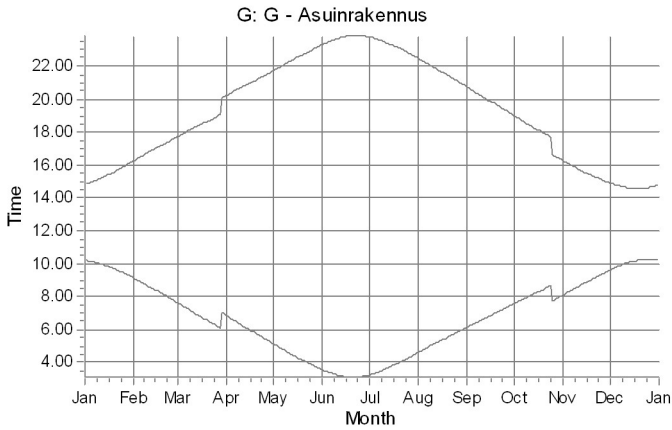
Calculation: VE2_Jolkka_RD200x7xHH195_No_forest_291025

**WTGs**

	WTG 2: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (490)
	WTG 5: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (493)
	WTG 7: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (494)
	WTG 8: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (495)

SHADOW - Calendar, graphical

Calculation: VE2_Jolkka_RD200x7xHH195_No_forest_291025

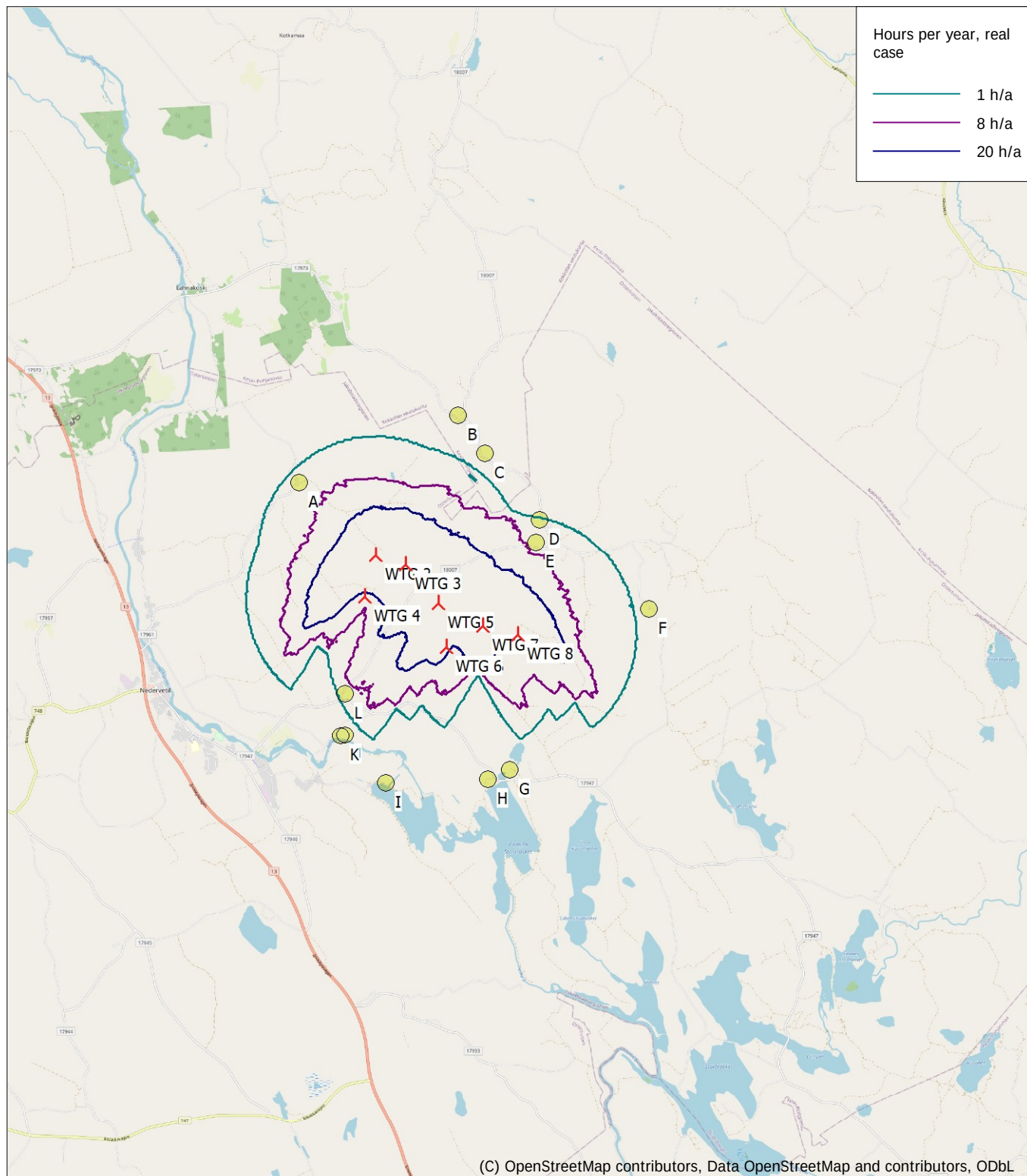


WTGs

WTG 6: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (492)

SHADOW - Map

Calculation: VE2_Jolkka_RD200x7xHH195_No_forest_291025



0 1 2 3 4 km

Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 324 510 North: 7 070 910
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 8. Skuggmodelleringens resultat "real case, luke forest" - Projektalternativ ALT2

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Luke_forest_291025

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) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
658	501	405	380	500	735	1 005	1 175	840	615	500	540	7 854

Monthly aggregation of real case reduction

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:

DHM: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)

Land cover data used in calculation:

Area object(s):

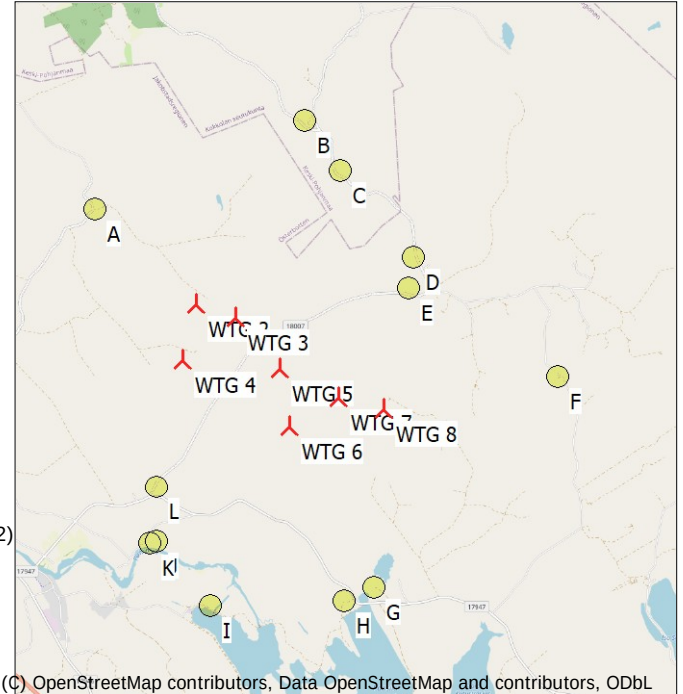
Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI

obstructions): REGIONS_Jolkka_meluvälkemallinnus_jk_0.w2r (5)

Receptor grid resolution: 1,0 m

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89



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

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
			[m]									[RPM]
WTG 2	322 459	7 071 970	42,5	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 3	322 968	7 071 771	35,0	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 4	322 233	7 071 257	44,6	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 5	323 504	7 071 059	45,0	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 6	323 609	7 070 303	45,5	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 7	324 270	7 070 629	45,0	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 8	324 869	7 070 455	48,0	Generic RD200 7200 200.0 !O! ...Yes	Generic		RD200-7 200	7 200	200,0	195,0	2 083	10,5

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	A - Asuinrakennus	321 194	7 073 316	32,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	B - Asuinrakennus	324 024	7 074 328	24,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	C - Asuinrakennus	324 459	7 073 641	29,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	D - Lomarakenus	325 375	7 072 435	30,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	E - Asuinrakennus	325 275	7 072 032	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	F - Lomarakenus	327 197	7 070 758	47,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	G - Asuinrakennus	324 595	7 068 088	51,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	H - Asuinrakennus	324 203	7 067 934	55,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	I - Asuinrakennus	322 423	7 067 969	42,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	J - Asuinrakennus	321 755	7 068 860	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	K - Asuinrakennus	321 664	7 068 837	33,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	L - Asuinrakennus	321 791	7 069 585	50,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henri Korhonen / henri.korhonen@fcg.fi
Calculated:
29.10.2025 13.04/4.1.273

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Luke_forest_291025

Calculation Results

Shadow receptor

No.	Name	Shadow, expected values
		Shadow hours per year [h/year]
A	A - Asuinrakennus	2:20
B	B - Asuinrakennus	0:00
C	C - Asuinrakennus	0:00
D	D - Lomarakenus	2:17
E	E - Asuinrakennus	4:34
F	F - Lomarakenus	0:00
G	G - Asuinrakennus	0:00
H	H - Asuinrakennus	0:00
I	I - Asuinrakennus	0:00
J	J - Asuinrakennus	0:00
K	K - Asuinrakennus	0:00
L	L - Asuinrakennus	0:00

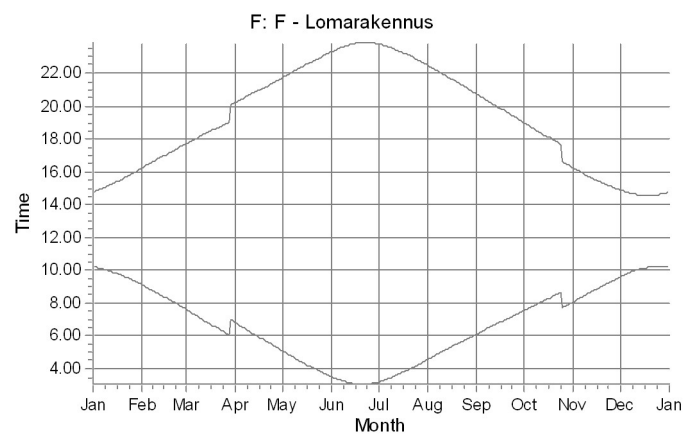
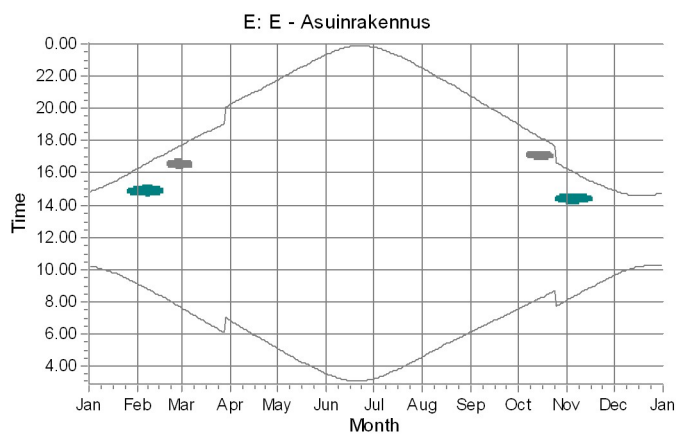
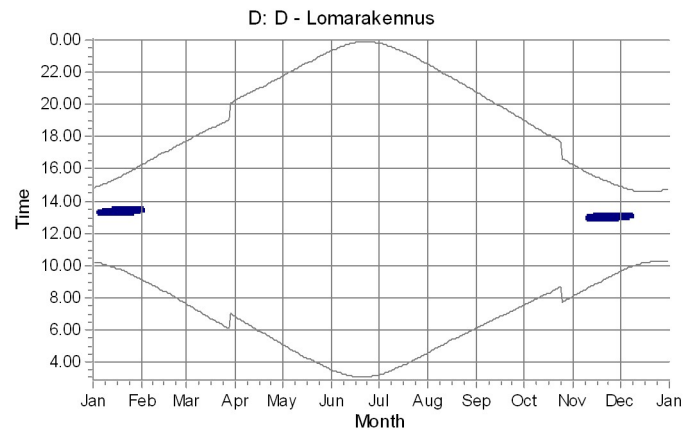
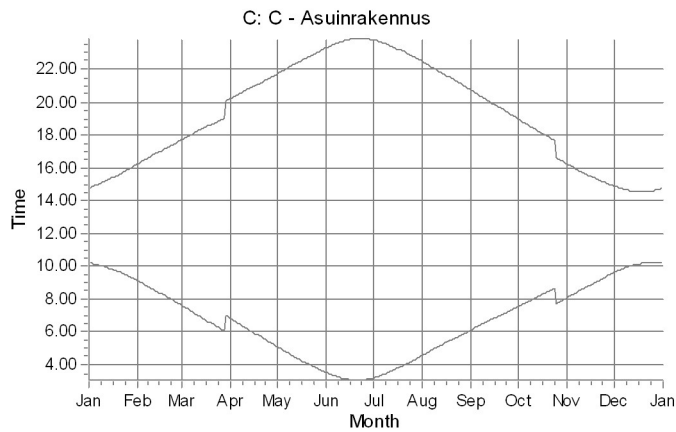
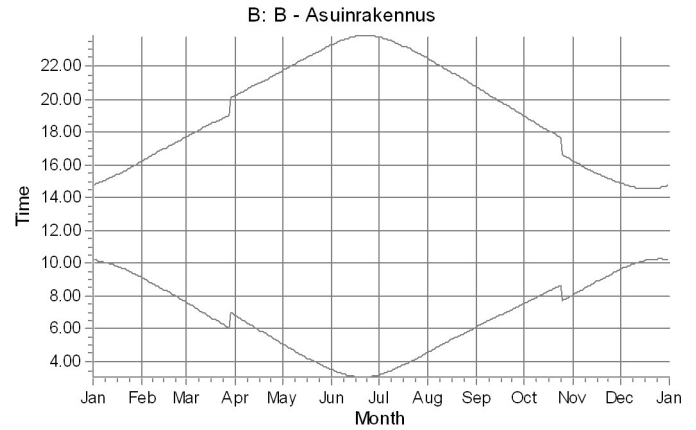
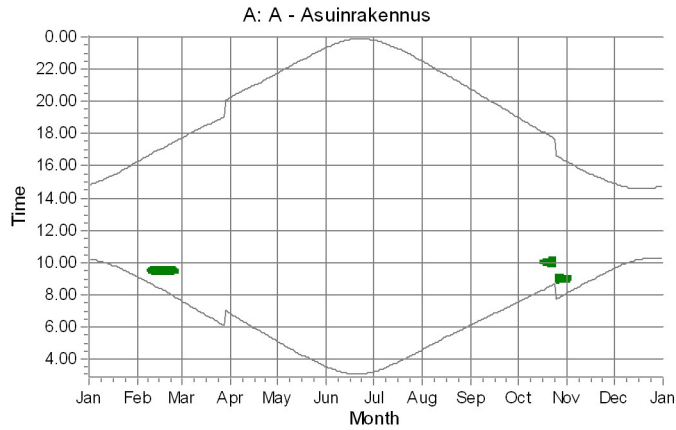
Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Expected [h/year]
WTG 2	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (490)	2:20
WTG 3	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (489)	0:00
WTG 4	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (491)	0:00
WTG 5	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (493)	1:47
WTG 6	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (492)	0:00
WTG 7	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (494)	2:47
WTG 8	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (495)	2:17

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: VE2_Jolkka_RD200x7xHH195_Luke_forest_291025

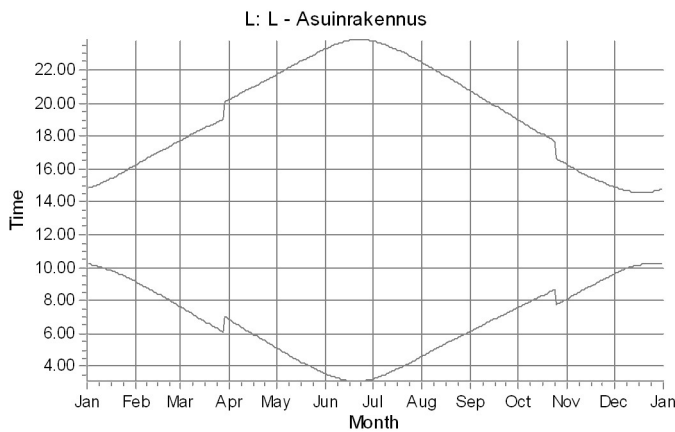
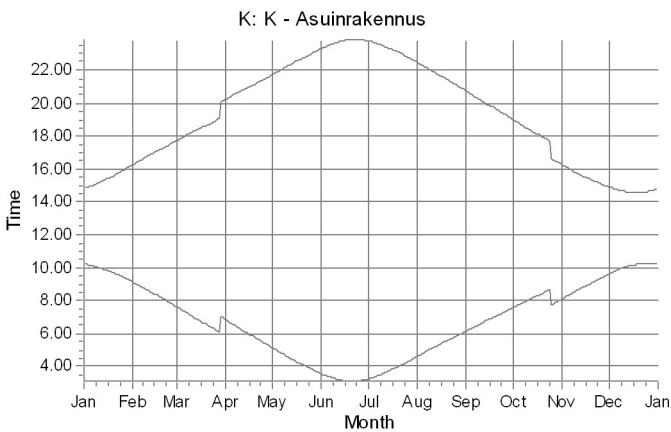
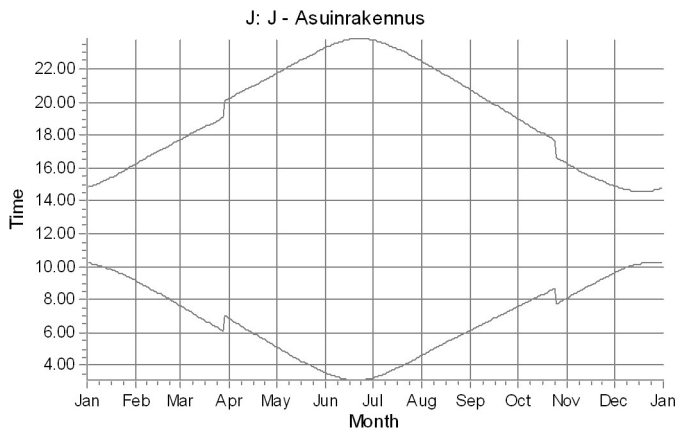
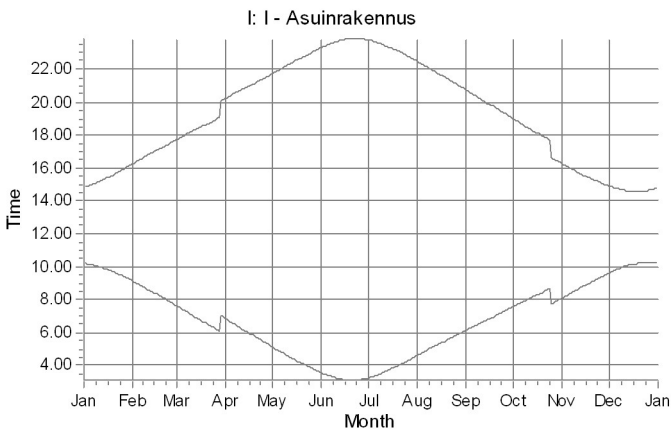
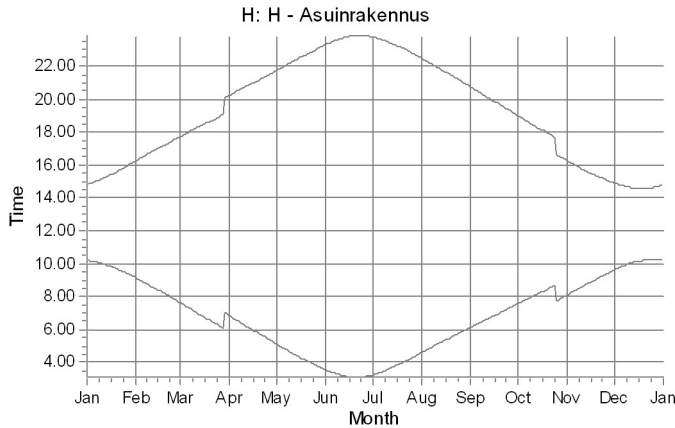
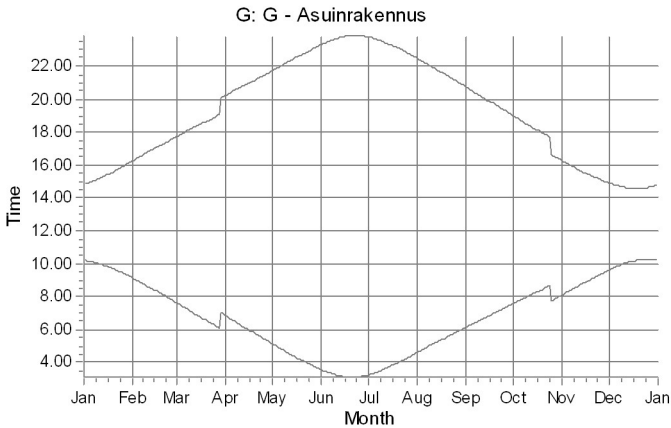


WTGs

	WTG 2: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (490)
	WTG 5: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (493)
	WTG 7: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (494)
	WTG 8: Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (495)

SHADOW - Calendar, graphical

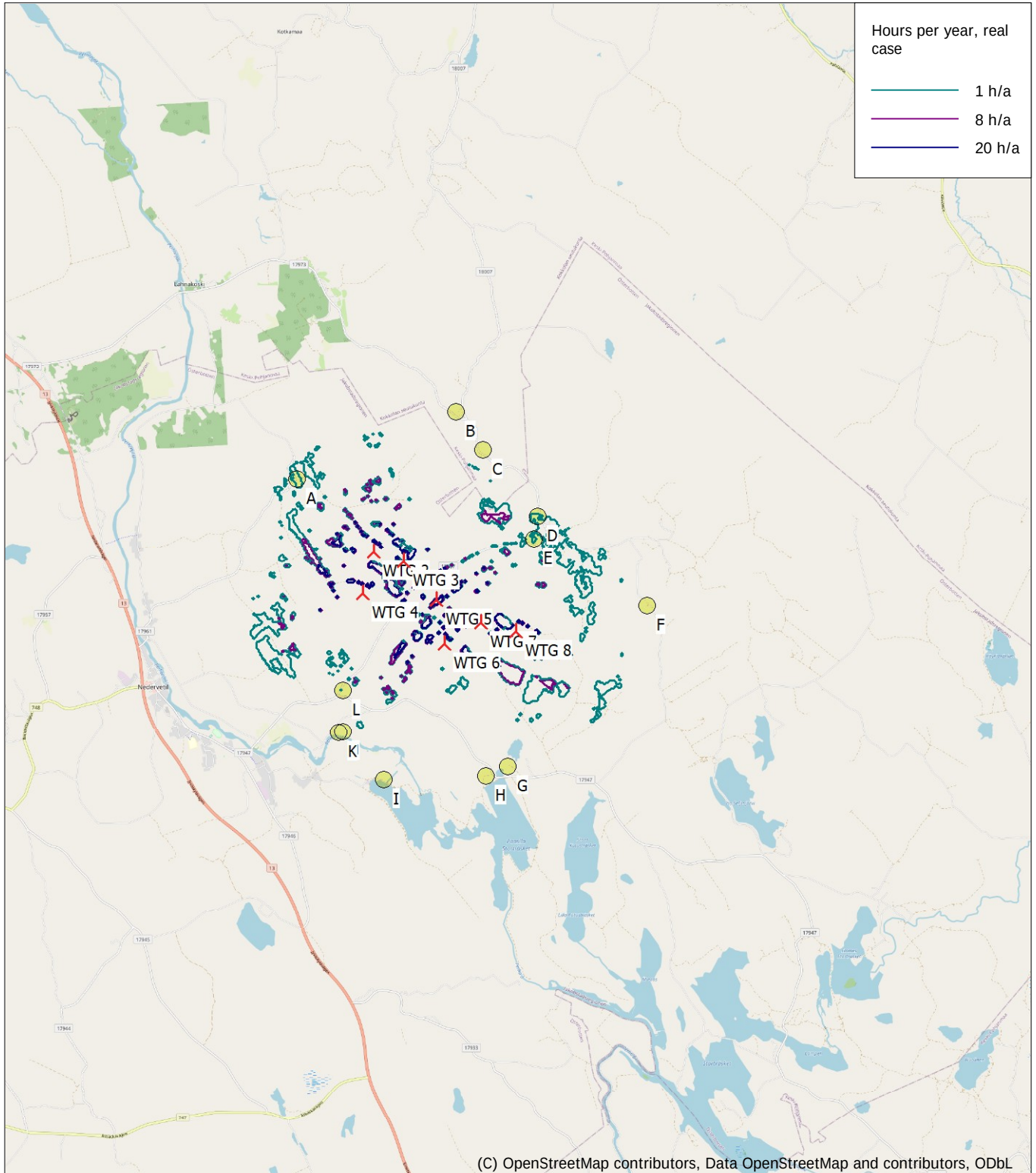
Calculation: VE2_Jolkka_RD200x7xHH195_Luke_forest_291025



WTGs

SHADOW - Map

Calculation: VE2_Jolkka_RD200x7xHH195_Luke_forest_291025



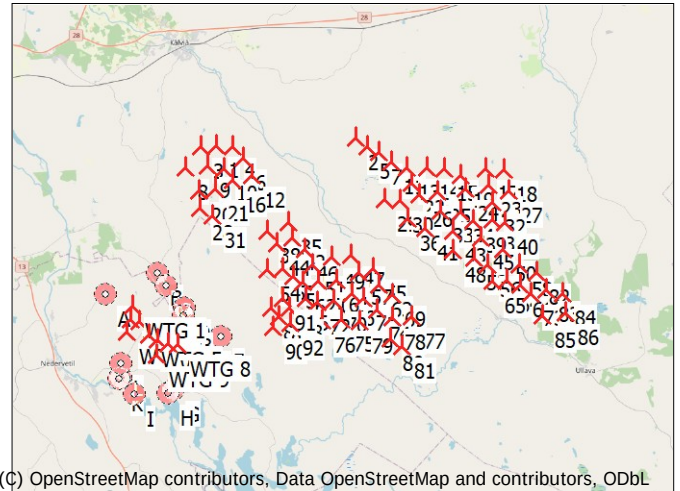
Map: EMD OpenStreetMap , Print scale 1:100 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 324 510 North: 7 070 910
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 9. Resultat av modellering av sammantaget buller - Projektalternativ ALT1

DECIBEL - Main Result

Calculation: VE1_Jolkka_V172x9xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

Calculation is done according to Finnish guideline "Ympäristöhallinnon ohjeita 2 | 2014" from the Ministry of the Environment of Finland

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

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

Scale 1:400 000

New WTG

Noise sensitive area

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)]	Uncertainty [dB(A)]
					Valid	Manufact.					Creator	Name			
			[m]												
1	327 493	7 080 879	37,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
10	327 857	7 079 670	47,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
11	336 750	7 079 496	57,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
12	329 315	7 079 265	47,3	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
13	337 502	7 079 237	62,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
14	338 583	7 079 171	70,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
15	339 488	7 079 062	70,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
16	328 261	7 079 000	52,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
17	341 673	7 078 896	84,7	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
18	342 656	7 078 786	75,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
19	340 323	7 078 666	69,3	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
2	334 916	7 080 924	46,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
20	326 431	7 078 599	47,2	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
21	327 317	7 078 601	54,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
22	337 737	7 078 366	70,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
23	341 773	7 078 046	78,7	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
24	340 574	7 077 913	75,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
25	339 061	7 077 861	75,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
26	338 100	7 077 748	79,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
27	342 877	7 077 698	84,9	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
28	326 451	7 077 616	50,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
29	336 295	7 077 559	64,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
3	326 673	7 080 846	35,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
30	337 106	7 077 452	75,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
31	327 137	7 077 191	50,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
32	341 960	7 077 158	77,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
33	339 128	7 076 855	77,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
34	340 263	7 076 697	74,9	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
35	331 082	7 076 638	50,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
36	337 438	7 076 482	77,1	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
37	341 914	7 076 211	97,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
38	329 973	7 076 196	56,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
39	340 897	7 076 194	87,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
4	328 373	7 080 746	35,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
40	342 574	7 076 008	97,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
41	338 290	7 075 921	77,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
42	331 266	7 075 805	50,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
43	339 797	7 075 701	77,2	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
44	330 434	7 075 485	55,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
45	341 273	7 075 296	92,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
46	331 862	7 075 200	44,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
47	334 322	7 074 675	52,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
48	339 714	7 074 658	74,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
49	333 295	7 074 655	51,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
5	335 479	7 080 381	52,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
50	342 340	7 074 618	97,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
51	332 230	7 074 358	60,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
52	340 852	7 074 260	77,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
53	330 691	7 074 248	65,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
54	329 892	7 074 163	55,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
55	335 510	7 073 932	57,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
56	341 490	7 073 830	77,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
57	334 674	7 073 827	50,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
58	343 223	7 073 796	91,3	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
59	331 186	7 073 794	63,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
6	328 915	7 080 121	38,1	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
60	332 541	7 073 461	60,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
61	333 495	7 073 434	58,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
62	331 719	7 073 391	55,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
63	335 684	7 073 090	55,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-								

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

17.2.2026 10.38/4.2.285

DECIBEL - Main Result

Calculation: VE1_Jolkka_V172x9xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

...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)]	Uncertainty [dB(A)]
						Valid	Manufact.	Creator					Name				
				[m]													
66	343	193	7 072 662	80,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
67	334	273	7 072 646	62,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
68	331	821	7 072 556	60,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
69	336	396	7 072 515	57,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
7	336	091	7 080 107	57,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
70	333	323	7 072 396	55,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
71	334	880	7 072 358	67,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
72	332	439	7 072 280	60,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
73	343	750	7 072 210	81,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
74	335	593	7 071 697	64,3	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
75	333	652	7 071 369	65,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
76	332	607	7 071 362	53,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
77	337	350	7 071 319	60,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
78	336	385	7 071 244	65,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
79	334	573	7 071 146	70,6	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
8	325	833	7 079 822	32,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
80	336	165	7 070 220	72,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
81	336	772	7 069 762	72,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
82	344	123	7 073 332	86,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
83	344	560	7 072 352	85,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
84	345	451	7 072 087	89,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
85	344	323	7 070 996	87,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
86	345	501	7 071 096	97,0	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
87	329	952	7 072 171	56,8	NORDEX N175 6500 175.0 IOI h...		Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
88	330	922	7 072 077	54,6	NORDEX N175 6500 175.0 IOI h...		Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
89	330	360	7 071 678	52,6	NORDEX N175 6500 175.0 IOI h...		Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
9	326	954	7 079 808	37,5	GE WIND ENERGY	GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
90	329	950	7 071 136	53,4	NORDEX N175 6500 175.0 IOI h...		Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
91	330	569	7 072 574	55,3	NORDEX N175 6500 175.0 IOI h...		Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
92	330	940	7 071 318	63,5	NORDEX N175 6500 175.0 IOI h...		Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
WTG 1	322	570	7 072 630	39,7	VESTAS V172-7.2 7200 172.0 IO...		Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 2	322	459	7 071 970	42,5	VESTAS V172-7.2 7200 172.0 IO...		Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 3	322	968	7 071 771	35,0	VESTAS V172-7.2 7200 172.0 IO...		Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 4	322	333	7 071 257	44,6	VESTAS V172-7.2 7200 172.0 IO...		Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 5	323	349	7 071 090	40,0	VESTAS V172-7.2 7200 172.0 IO...		Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 6	323	833	7 070 792	45,0	VESTAS V172-7.2 7200 172.0 IO...		Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 7	324	359	7 070 588	48,8	VESTAS V172-7.2 7200 172.0 IO...		Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 8	324	934	7 070 443	50,7	VESTAS V172-7.2 7200 172.0 IO...		Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 9	323	712	7 069 988	49,7	VESTAS V172-7.2 7200 172.0 IO...		Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0

Calculation Results

Sound level

Noise sensitive area

No.	Name	East	North	Z	Immission height	Noise	Sound level From WTGs	Distance to noise demand	2 dB penalty applied for one or more WTGs
		[m]			[m]	[dB(A)]	[dB(A)]	[m]	
A	A - Asuinrakennus	321 194	7 073 316	32,0	4,0	40,0	34,6	759	No
B	B - Asuinrakennus	324 024	7 074 328	24,7	4,0	40,0	33,0	1 470	No
C	C - Asuinrakennus	324 459	7 073 641	29,1	4,0	40,0	34,0	1 291	No
D	D - Lomarakennus	325 375	7 072 435	30,0	4,0	40,0	35,1	1 046	No
E	E - Asuinrakennus	325 275	7 072 032	32,5	4,0	40,0	36,5	652	No
F	F - Lomarakennus	327 197	7 070 758	47,1	4,0	40,0	34,1	1 545	No
G	G - Asuinrakennus	324 595	7 068 088	51,4	4,0	40,0	32,7	1 286	No
H	H - Asuinrakennus	324 203	7 067 934	55,2	4,0	40,0	32,3	1 334	No
I	I - Asuinrakennus	322 423	7 067 969	42,5	4,0	40,0	31,1	1 639	No
J	J - Asuinrakennus	321 755	7 068 860	35,0	4,0	40,0	32,6	1 438	No
K	K - Asuinrakennus	321 664	7 068 837	33,5	4,0	40,0	32,3	1 525	No
L	L - Asuinrakennus	321 791	7 069 585	50,0	4,0	40,0	35,0	887	No

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L
1	9841	7412	7847	8704	9119	10124	13113	13354	13867	13316	13375	12649
10	9205	6574	6920	7647	8061	8935	12031	12289	12899	12411	12475	11766
11	16736	13733	13613	13386	13686	12945	16667	17059	18386	18381	18468	17942
12	10065	7235	7429	7883	8283	8765	12131	12428	13230	12859	12931	12258
13	17347	14342	14191	13902	14189	13343	17053	17451	18821	18856	18944	18436
14	18345	15341	15166	14824	15099	14155	17844	18247	19660	19733	19822	19333
15	19172	16170	15975	15589	15854	14831	18497	18904	20351	20455	20545	20072
16	9067	6306	6570	7170	7579	8309	11509	11784	12478	12045	12114	11422
17	21222	18228	17996	17529	17774	16604	20208	20621	22132	22300	22391	21951
18	22145	19156	18908	18408	18644	17417	20989	21404	22940	23135	23226	22801
19	19860	16864	16639	16192	16443	15322	18952	19363	20850	20995	21086	20634
2	15687	12732	12742	12769	13113	12762	16468	16835	17995	17850	17933	17342

To be continued on next page...

DECIBEL - Main Result

Calculation: VE1_Jolkka_V172x9xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L
20	7437	4902	5335	6252	6666	7877	10668	10893	11358	10801	10861	10136
21	8087	5394	5724	6463	6877	7843	10858	11110	11702	11215	11280	10573
22	17294	14293	14092	13709	13977	12997	16681	17085	18507	18592	18682	18201
23	21112	18132	17863	17329	17557	16294	19853	20269	21814	22022	22114	21697
24	19915	16932	16670	16154	16388	15168	18755	19170	20693	20880	20972	20544
25	18433	15444	15198	14720	14965	13826	17455	17866	19354	19504	19595	19148
26	17474	14484	14244	13787	14039	12949	16602	17010	18474	18602	18693	18235
27	22118	19149	18857	18274	18489	17145	20651	21070	22647	22893	22986	22590
28	6790	4086	4446	5290	5705	6898	9705	9938	10452	9934	9997	9283
29	15683	12687	12466	12060	12326	11357	15051	15452	16862	16941	17030	16549
3	9311	7035	7536	8509	8922	10100	12924	13144	13558	12953	13009	12271
30	16438	13448	13207	12757	13011	11956	15625	16031	17476	17589	17679	17215
31	7093	4229	4446	5071	5483	6433	9450	9709	10355	9916	9985	9295
32	21115	18156	17849	17242	17452	16088	19588	20007	21587	21839	21932	21541
33	18277	15312	15015	14444	14666	13397	16970	17385	18919	19121	19213	18797
34	19363	16409	16095	15484	15695	14350	17875	18292	19858	20096	20188	19791
35	10429	7425	7269	7086	7410	7046	10731	11092	12251	12142	12226	11663
36	16547	13584	13285	12722	12949	11730	15341	15753	17258	17434	17526	17097
37	20918	17987	17641	16962	17153	15692	19127	19547	21159	21454	21547	21183
38	9237	6235	6076	5939	6276	6105	9728	10075	11164	11014	11097	10517
39	19909	16974	16633	15968	16164	14737	18204	18623	20219	20496	20588	20214
4	10330	7751	8111	8833	9246	10055	13208	13471	14092	13601	13666	12955
40	21545	18624	18267	17564	17747	16246	19644	20064	21692	22009	22102	21750
41	17290	14353	14016	13375	13581	12234	15775	16191	17745	17977	18069	17671
42	10373	7390	7142	6785	7078	6482	10199	10573	11813	11774	11861	11332
43	18752	15831	15474	14785	14976	13533	16999	17418	19014	19292	19385	19014
44	9489	6513	6252	5906	6206	5728	9422	9788	10983	10916	11002	10463
45	20173	17274	16893	16151	16325	14787	18166	18587	20221	20549	20642	20299
46	10831	7885	7564	7050	7308	6440	10166	10555	11888	11929	12018	11529
47	13196	10302	9916	9222	9423	8129	11746	12157	13656	13845	13936	13523
48	18565	15691	15287	14508	14673	13108	16482	16903	18537	18869	18962	18624
49	12172	9275	8893	8224	8436	7236	10899	11304	12761	12911	13002	12570
5	15934	12954	12916	12852	13182	12694	16416	16792	18012	17916	18000	17430
50	21183	18316	17906	17102	17257	15625	18906	19327	20995	21372	21465	21154
51	11083	8205	7803	7118	7332	6187	9878	10279	11703	11828	11919	11477
52	19677	16826	16403	15582	15733	14095	17387	17808	19470	19843	19936	19623
53	9541	6667	6261	5616	5850	4938	8665	9051	10380	10433	10522	10046
54	8737	5870	5457	4835	5084	4342	8059	8434	9702	9711	9799	9303
55	14327	11491	11053	10243	10408	8897	12379	12797	14379	14658	14751	14389
56	20299	17471	17030	16173	16312	14617	17842	18262	19945	20348	20442	20148
57	13487	10660	10215	9401	9567	8081	11597	12013	13577	13839	13931	13561
58	22031	19204	18762	17897	18032	16309	19480	19900	21598	22025	22118	21839
59	10001	7181	6728	5967	6167	5012	8716	9114	10521	10642	10732	10293
6	10290	7580	7863	8460	8868	9518	12783	13064	13775	13342	13410	12716
60	11346	8560	8083	7238	7404	5987	9591	10002	11511	11724	11816	11426
61	12299	9512	9037	8180	8337	6842	10381	10796	12345	12597	12690	12319
62	10523	7751	7263	6414	6584	5232	8880	9286	10760	10944	11036	10631
63	14489	11724	11237	10328	10461	8800	12163	12583	14213	14555	14648	14326
64	21295	18513	18041	17121	17239	15451	18549	18968	20681	21138	21231	20973
65	20552	17772	17298	16378	16495	14714	17831	18250	19958	20407	20500	20238
66	22005	19239	18757	17817	17927	16107	19150	19567	21291	21770	21863	21619
67	13094	10385	9863	8899	9017	7322	10696	11116	12738	13076	13169	12850
68	10652	7995	7441	6446	6566	4960	8494	8909	10456	10721	10814	10459
69	15220	12502	11988	11020	11130	9364	12602	13023	14692	15088	15181	14894
7	16369	13378	13307	13177	13495	12902	16629	17012	18277	18218	18304	17751
70	12161	9496	8950	7947	8055	6340	9732	10151	11763	12094	12187	11868
71	13717	11032	10498	9504	9609	7846	11134	11555	13205	13581	13674	13377
72	11290	8659	8094	7064	7167	5457	8892	9310	10903	11216	11309	10982
73	22580	19837	19342	18374	18473	16614	19591	20006	21742	22246	22339	22113
74	14487	11863	11301	10243	10322	8447	11573	11993	13685	14123	14217	13961
75	12607	10071	9468	8344	8402	6482	9631	10052	11731	12157	12250	11993
76	11577	9080	8460	7310	7361	5442	8654	9074	10733	11135	11228	10959
77	16276	13660	13097	12025	12094	10167	13156	13573	15296	15785	15878	15653
78	15329	12738	12163	11072	11136	9199	12203	12621	14339	14821	14914	14686
79	13551	11017	10416	9286	9338	7385	10434	10854	12556	13018	13111	12875
8	7989	5783	6331	7400	7808	9165	11797	11997	12332	11693	11747	11004

To be continued on next page...

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

17.2.2026 10.38/4.2.285

DECIBEL - Main Result

Calculation: VE1_Jolkka_V172x9xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L
80	15285	12815	12194	11013	11038	8982	11763	12176	13923	14472	14564	14386
81	15975	13539	12908	11704	11717	9625	12290	12699	14458	15042	15133	14980
82	22926	20121	19664	18767	18890	17118	20217	20635	22350	22808	22901	22641
83	23382	20628	20140	19183	19285	17434	20413	20828	22564	23068	23161	22934
84	24285	21541	21047	20077	20173	18300	21233	21647	23390	23912	24004	23789
85	23242	20568	20037	19000	19074	17125	19939	20349	22105	22666	22758	22573
86	24405	21716	21193	20168	20245	18305	21119	21528	23286	23848	23940	23755
87	8831	6308	5686	4584	4678	3096	6735	7140	8621	8839	8932	8560
88	9804	7255	6649	5557	5646	3950	7478	7892	9438	9713	9806	9463
89	9309	6867	6218	5041	5096	3293	6790	7204	8759	9053	9146	8819
9	8677	6213	6652	7539	7953	9052	11953	12186	12674	12117	12177	11451
90	9021	6729	6034	4754	4759	2777	6160	6577	8164	8503	8596	8303
91	9402	6775	6202	5195	5321	3829	7470	7876	9356	9563	9655	9272
92	9946	7541	6884	5675	5709	3784	7119	7538	9150	9507	9600	9310
WTG 1	1537	2235	2142	2811	2770	4991	4973	4971	4663	3856	3899	3143
WTG 2	1846	2830	2606	2953	2817	4890	4430	4396	4000	3187	3231	2476
WTG 3	2352	2766	2391	2497	2322	4348	4026	4030	3840	3152	3209	2482
WTG 4	2306	3554	3261	3355	3139	4988	3952	3862	3293	2443	2485	1729
WTG 5	3097	3306	2781	2432	2144	3863	3251	3270	3255	2740	2812	2166
WTG 6	3650	3540	2916	2253	1902	3364	2809	2882	3155	2837	2919	2372
WTG 7	4177	3754	3054	2108	1710	2843	2511	2658	3257	3125	3213	2757
WTG 8	4715	3990	3233	2041	1626	2285	2379	2612	3524	3550	3641	3257
WTG 9	4172	4350	3728	2958	2573	3569	2095	2112	2395	2258	2348	1962

DECIBEL - Assumptions for noise calculation

Calculation: VE1_Jolkka_V172x9xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

Noise calculation model:

ISO 9613-2:2024 Finland

Wind speed (at 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_Jolkka_meluvälkemallinnus_0.w2r (1)

Area type with hard ground: vesisto_meluvalke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

Selected option: Fixed value: 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:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

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:

Uncertainty added to source noise level of the WTGs in the calculation

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

0,0 dB(A)

Octave data required

Input parameters for calculation of air absorption:

Temperature 15,0 °C

Relative humidity 70,0 %

Pressure 101,325 kPa

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]
0,1	0,4	1,1	2,4	4,1	8,7	26,4	93,7

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: GE WIND ENERGY GE158 - 6.1 MW 6100 158.0 !O!

Noise: GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB

Source

Source/Date Creator Edited

Noise_Emission_4.x_5.x_6.x-158-50Hz_IEC_EN_r01 30.5.2018 USER 26.9.2025 14.18

Octave data

Status	Hub height	Wind speed	LwA,ref	Pure tones	63	125	250	500	1000	2000	4000	8000
	[m]	[m/s]	[dB(A)]		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	221,0	8,0	110,0	No	91,2	96,4	100,9	103,4	105,4	103,3	95,8	79,8

WTG: NORDEX N175 6500 175.0 !O!

Noise: Mode 0 STE 106.9 dB + 1.5 dB

Source

Source/Date Creator Edited

F008_278_A17_EN Revision 01, 2022-05-08 28.10.2024 USER 10.1.2025 15.52

Octave data

Status	Hub height	Wind speed	LwA,ref	Pure tones	63	125	250	500	1000	2000	4000	8000
	[m]	[m/s]	[dB(A)]		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	212,5	8,0	108,4	No	91,2	98,0	101,4	101,9	102,8	100,7	91,4	74,9

DECIBEL - Assumptions for noise calculation

Calculation: VE1_Jolkka_V172x9xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

WTG: VESTAS V172-7.2 7200 172.0 !O!

Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Manufacturer DMS no.: 0128-4336_01	29.11.2024	USER	13.10.2025 15.56

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	209,0	8,0	107,8	No	89,8	96,8	101,4	100,4	101,0	99,9	98,3	85,5

Noise sensitive area: A A - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: B B - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: C C - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: D D - Lomarakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: E E - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: F F - Lomarakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

DECIBEL - Assumptions for noise calculation

Calculation: VE1_Jolkka_V172x9xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

Noise sensitive area: G G - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: H H - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: I I - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: J J - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: K K - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: L L - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

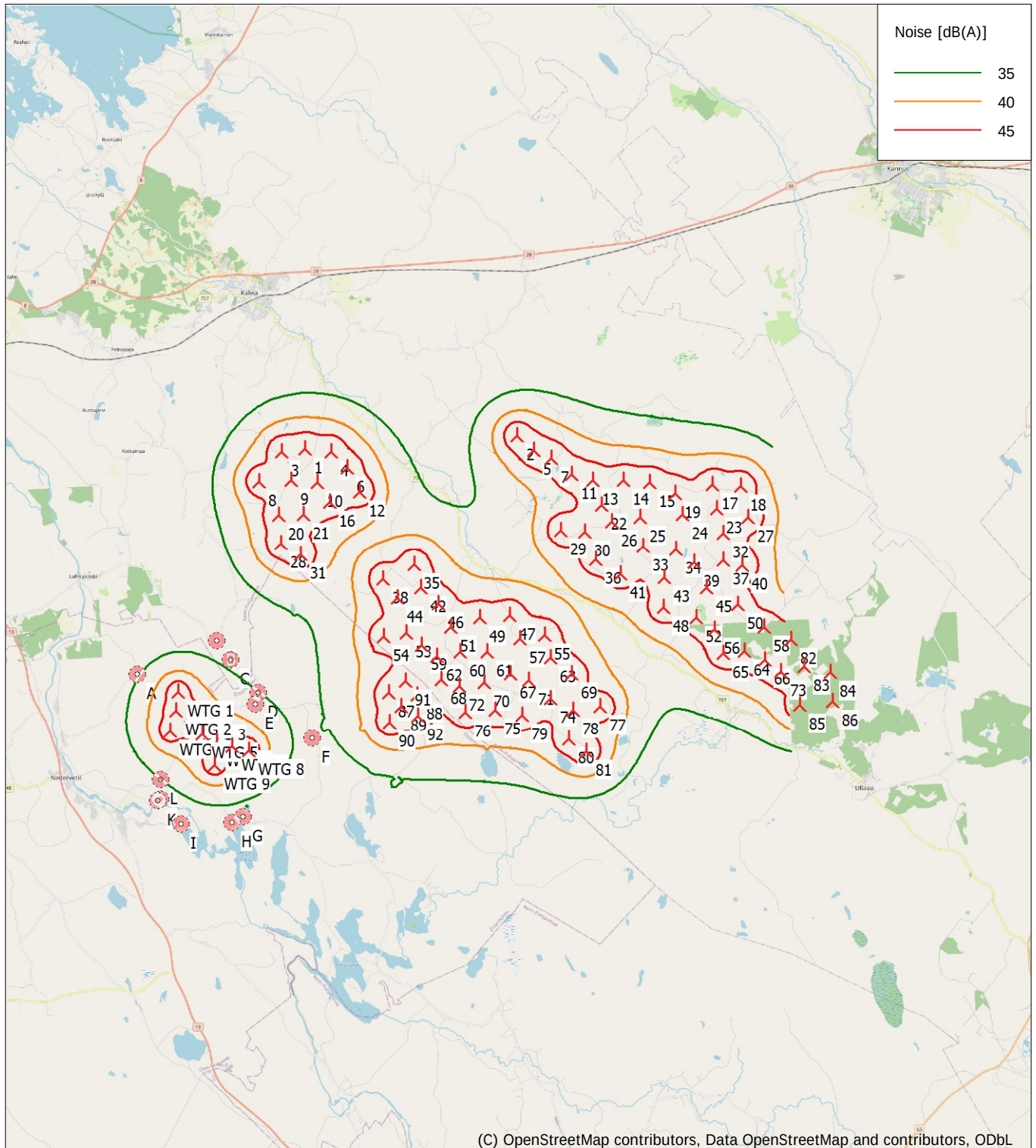
Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

DECIBEL - Map 8,0 m/s

Calculation: VE1_Jolkka_V172x9xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025



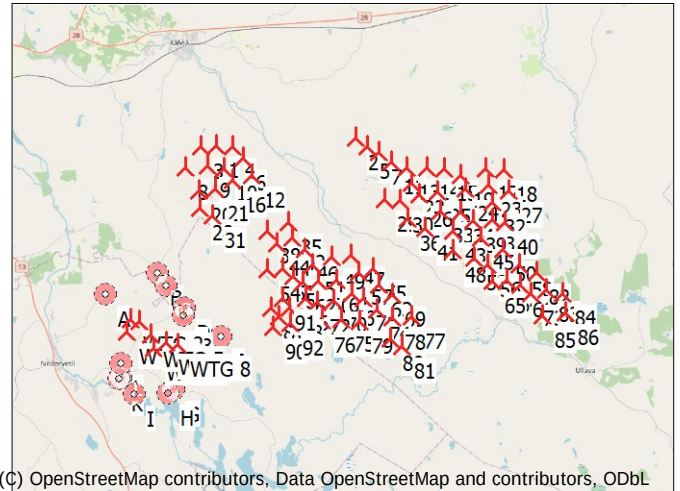
Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 333 867 North: 7 075 343
New WTG Noise sensitive area
Noise calculation model: ISO 9613-2:2024 Finland. Wind speed: 8,0 m/s
Height above sea level from active line object

Bilaga 10. Resultat av modellering av sammantaget buller - Projekialternativ ALT2

DECIBEL - Main Result

Calculation: VE2_Jolkka_V172x7xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

Calculation is done according to Finnish guideline "Ympäristöhallinnon ohjeita 2 | 2014" from the Ministry of the Environment of Finland

All coordinates are in
Finish TM ETRS-TM35FIN-ETRS89

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

Scale 1:400 000

New WTG

Noise sensitive area

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)]	Uncertainty [dB(A)]
					Valid	Manufact.					Creator	Name			
			[m]												
1	327 493	7 080 879	37,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
10	327 857	7 079 670	47,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
11	336 750	7 079 496	57,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
12	329 315	7 079 265	47,3	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
13	337 502	7 079 237	62,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
14	338 583	7 079 171	70,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
15	339 488	7 079 062	70,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
16	328 261	7 079 000	52,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
17	341 673	7 078 896	84,7	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
18	342 656	7 078 786	75,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
19	340 323	7 078 666	69,3	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
2	334 916	7 080 924	46,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
20	326 431	7 078 599	47,2	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
21	327 317	7 078 601	54,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
22	337 737	7 078 366	70,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
23	341 773	7 078 404	78,7	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
24	340 574	7 077 913	75,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
25	339 061	7 077 861	75,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
26	338 100	7 077 748	79,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
27	342 877	7 077 698	84,9	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
28	326 451	7 077 616	50,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
29	336 295	7 077 559	64,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
3	326 673	7 080 846	35,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
30	337 106	7 077 452	75,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
31	327 137	7 077 191	50,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
32	341 960	7 077 158	77,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
33	339 128	7 076 855	77,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
34	340 263	7 076 697	74,9	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
35	331 082	7 076 638	50,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
36	337 438	7 076 482	77,1	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
37	341 914	7 076 211	97,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
38	329 973	7 076 196	56,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
39	340 897	7 076 194	87,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
4	328 373	7 080 746	35,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
40	342 574	7 076 008	97,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
41	338 290	7 075 921	77,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
42	331 266	7 075 805	50,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
43	339 797	7 075 701	77,2	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
44	330 434	7 075 485	55,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
45	341 273	7 075 296	92,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
46	331 862	7 075 200	44,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
47	334 322	7 074 675	52,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
48	339 714	7 074 658	74,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
49	333 295	7 074 655	51,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
5	335 479	7 080 381	52,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
50	342 340	7 074 618	97,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
51	332 230	7 074 358	60,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
52	340 852	7 074 260	77,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
53	330 691	7 074 248	65,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
54	329 892	7 074 163	55,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
55	335 510	7 073 932	57,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
56	341 490	7 073 830	77,5	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
57	334 674	7 073 827	50,8	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
58	343 223	7 073 796	91,3	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
59	331 186	7 073 794	63,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
6	328 915	7 080 121	38,1	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
60	332 541	7 073 461	60,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
61	333 495	7 073 434	58,4	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
62	331 719	7 073 391	55,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107,0 dB + 2dB + 1 dB	8,0	110,0	0,0
63	335 684	7 073 090	55,0	GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,					

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

17.2.2026 10.24/4.2.285

DECIBEL - Main Result

Calculation: VE2_Jolkka_V172x7xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

...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)]	Uncertainty [dB(A)]
					Valid	Manufact.					Creator	Name			
			[m]												
66	343	193	7 072 662	80.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
67	334	273	7 072 646	62.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
68	331	821	7 072 556	60.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
69	336	396	7 072 515	57.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
7	336	091	7 080 107	57.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
70	333	323	7 072 396	55.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
71	334	880	7 072 358	67.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
72	332	439	7 072 280	60.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
73	343	750	7 072 210	81.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
74	335	593	7 071 697	64.3 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
75	333	652	7 071 369	65.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
76	332	607	7 071 362	53.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
77	337	350	7 071 319	60.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
78	336	385	7 071 244	65.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
79	334	573	7 071 146	70.6 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
8	325	833	7 079 822	32.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
80	336	165	7 070 220	72.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
81	336	772	7 069 762	72.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
82	344	123	7 073 332	86.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
83	344	560	7 072 352	85.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
84	345	451	7 072 087	89.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
85	344	323	7 070 996	87.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
86	345	501	7 071 096	97.0 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
87	329	952	7 072 171	56.8 NORDEX N175 6500 175.0 IOI h...	Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
88	330	922	7 072 077	54.6 NORDEX N175 6500 175.0 IOI h...	Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
89	330	360	7 071 678	52.6 NORDEX N175 6500 175.0 IOI h...	Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
9	326	954	7 079 808	37.5 GE WIND ENERGY GE158 - 6.1 ...	Yes	GE WIND ENERGY	GE158 - 6.1 MW-6 100	6 100	158,0	221,0	USER	GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB	8,0	110,0	0,0
90	329	950	7 071 136	53.4 NORDEX N175 6500 175.0 IOI h...	Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
91	330	569	7 072 574	55.3 NORDEX N175 6500 175.0 IOI h...	Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
92	330	940	7 071 318	63.5 NORDEX N175 6500 175.0 IOI h...	Yes	NORDEX	N175-6 500	6 500	175,0	212,5	USER	Mode 0 STE 106.9 dB + 1.5 dB	8,0	108,4	0,0
WTG 2	322	459	7 071 970	42.5 VESTAS V172-7.2 7200 172.0 IO...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 3	322	968	7 071 771	35,0 VESTAS V172-7.2 7200 172.0 IO...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 4	322	233	7 071 257	44,6 VESTAS V172-7.2 7200 172.0 IO...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 5	323	504	7 071 059	45,0 VESTAS V172-7.2 7200 172.0 IO...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 6	323	609	7 070 303	45,5 VESTAS V172-7.2 7200 172.0 IO...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 7	324	270	7 070 629	45,0 VESTAS V172-7.2 7200 172.0 IO...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0
WTG 8	324	869	7 070 455	48,0 VESTAS V172-7.2 7200 172.0 IO...	Yes	VESTAS	V172-7.2-7 200	7 200	172,0	209,0	USER	V172 - 7.2 MW P07200 STE	8,0	107,8	0,0

Calculation Results

Sound level

Noise sensitive area

Demands Sound level

No.	Name	East	North	Z	Immission height	Noise	From WTGs	Distance to noise demand	2 dB penalty applied for one or more WTGs
				[m]	[m]	[dB(A)]	[dB(A)]	[m]	
A	A - Asuinrakennus	321 194	7 073 316	32,0	4,0	40,0	32,7	1 094	No
B	B - Asuinrakennus	324 024	7 074 328	24,7	4,0	40,0	31,9	1 895	No
C	C - Asuinrakennus	324 459	7 073 641	29,1	4,0	40,0	33,0	1 533	No
D	D - Lomarakenus	325 375	7 072 435	30,0	4,0	40,0	34,5	1 142	No
E	E - Asuinrakennus	325 275	7 072 032	32,5	4,0	40,0	35,8	744	No
F	F - Lomarakenus	327 197	7 070 758	47,1	4,0	40,0	33,8	1 634	No
G	G - Asuinrakennus	324 595	7 068 088	51,4	4,0	40,0	31,7	1 518	No
H	H - Asuinrakennus	324 203	7 067 934	55,2	4,0	40,0	31,3	1 614	No
I	I - Asuinrakennus	322 423	7 067 969	42,5	4,0	40,0	30,2	1 851	No
J	J - Asuinrakennus	321 755	7 068 860	35,0	4,0	40,0	31,8	1 545	No
K	K - Asuinrakennus	321 664	7 068 837	33,5	4,0	40,0	31,5	1 627	No
L	L - Asuinrakennus	321 791	7 069 585	50,0	4,0	40,0	34,3	944	No

Distances (m)

WTG	A	B	C	D	E	F	G	H	I	J	K	L
1	9841	7412	7847	8704	9119	10124	13113	13354	13867	13316	13375	12649
10	9205	6574	6920	7647	8061	8935	12031	12289	12899	12411	12475	11766
11	16736	13733	13613	13386	13686	12945	16667	17059	18386	18381	18468	17942
12	10065	7235	7429	7883	8283	8765	12131	12428	13230	12859	12931	12258
13	17347	14342	14191	13902	14189	13343	17053	17451	18821	18856	18944	18436
14	18345	15341	15166	14824	15099	14155	17844	18247	19660	19733	19822	19333
15	19172	16170	15975	15589	15854	14831	18497	18904	20351	20455	20545	20072
16	9067	6306	6570	7170	7579	8309	11509	11784	12478	12045	12114	11422
17	21222	18228	17996	17529	17774	16604	20208	20621	22132	22300	22391	21951
18	22145	19156	18908	18408	18644	17417	20989	21404	22940	23135	23226	22801
19	19860	16864	16639	16192	16443	15322	18952	19363	20850	20995	21086	20634
2	15687	12732	12742	12769	13113	12762	16468	16835	17995	17850	17933	17342
20	7437	4902	5335	6252	6666	7877	10668	10893	11358	10801	10861	10136
21	8087	5394	5724	6463	6877	7843	10858	11110	11702	11215	11280	10573

To be continued on next page...

DECIBEL - Main Result

Calculation: VE2_Jolkka_V172x7xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L
22	17294	14293	14092	13709	13977	12997	16681	17085	18507	18592	18682	18201
23	21112	18132	17863	17329	17557	16294	19853	20269	21814	22022	22114	21697
24	19915	16932	16670	16154	16388	15168	18755	19170	20693	20880	20972	20544
25	18433	15444	15198	14720	14965	13826	17455	17866	19354	19504	19595	19148
26	17474	14484	14244	13787	14039	12949	16602	17010	18474	18602	18693	18235
27	22118	19149	18857	18274	18489	17145	20651	21070	22647	22893	22986	22590
28	6790	4086	4446	5290	5705	6898	9705	9938	10452	9934	9997	9283
29	15683	12687	12466	12060	12326	11357	15051	15452	16862	16941	17030	16549
3	9311	7035	7536	8509	8922	10100	12924	13144	13558	12953	13009	12271
30	16438	13448	13207	12757	13011	11956	15625	16031	17476	17589	17679	17215
31	7093	4229	4446	5071	5483	6433	9450	9709	10355	9916	9985	9295
32	21115	18156	17849	17242	17452	16088	19588	20007	21587	21839	21932	21541
33	18277	15312	15015	14444	14666	13397	16970	17385	18919	19121	19213	18797
34	19363	16409	16095	15484	15695	14350	17875	18292	19858	20096	20188	19791
35	10429	7425	7269	7086	7410	7046	10731	11092	12251	12142	12226	11663
36	16547	13584	13285	12722	12949	11730	15341	15753	17258	17434	17526	17097
37	20918	17987	17641	16962	17153	15692	19127	19547	21159	21454	21547	21183
38	9237	6235	6076	5939	6276	6105	9728	10075	11164	11014	11097	10517
39	19909	16974	16633	15968	16164	14737	18204	18623	20219	20496	20588	20214
4	10330	7751	8111	8833	9246	10055	13208	13471	14092	13601	13666	12955
40	21545	18624	18267	17564	17747	16246	19644	20064	21692	22009	22102	21750
41	17290	14353	14016	13375	13581	12234	15775	16191	17745	17977	18069	17671
42	10373	7390	7142	6785	7078	6482	10199	10573	11813	11774	11861	11332
43	18752	15831	15474	14785	14976	13533	16999	17418	19014	19292	19385	19014
44	9489	6513	6252	5906	6206	5728	9422	9788	10983	10916	11002	10463
45	20173	17274	16893	16151	16325	14787	18166	18587	20221	20549	20642	20299
46	10831	7885	7564	7050	7308	6440	10166	10555	11888	11929	12018	11529
47	13196	10302	9916	9222	9423	8129	11746	12157	13656	13845	13936	13523
48	18565	15691	15287	14508	14673	13108	16482	16903	18537	18869	18962	18624
49	12172	9275	8893	8224	8436	7236	10899	11304	12761	12911	13002	12570
5	15934	12954	12916	12852	13182	12694	16416	16792	18012	17916	18000	17430
50	21183	18316	17906	17102	17257	15625	18906	19327	20995	21372	21465	21154
51	11083	8205	7803	7118	7332	6187	9878	10279	11703	11828	11919	11477
52	19677	16826	16403	15582	15733	14095	17387	17808	19470	19843	19936	19623
53	9541	6667	6261	5616	5850	4938	8665	9051	10380	10433	10522	10046
54	8737	5870	5457	4835	5084	4342	8059	8434	9702	9711	9799	9303
55	14327	11491	11053	10243	10408	8897	12379	12797	14379	14658	14751	14389
56	20299	17471	17030	16173	16312	14617	17842	18262	19945	20348	20442	20148
57	13487	10660	10215	9401	9567	8081	11597	12013	13577	13839	13931	13561
58	22031	19204	18762	17897	18032	16309	19480	19900	21598	22025	22118	21839
59	10001	7181	6728	5967	6167	5012	8716	9114	10521	10642	10732	10293
6	10290	7580	7863	8460	8868	9518	12783	13064	13775	13342	13410	12716
60	11346	8560	8083	7238	7404	5987	9591	10002	11511	11724	11816	11426
61	12299	9512	9037	8180	8337	6842	10381	10796	12345	12597	12690	12319
62	10523	7751	7263	6414	6584	5232	8880	9286	10760	10944	11036	10631
63	14489	11724	11237	10328	10461	8800	12163	12583	14213	14555	14648	14326
64	21295	18513	18041	17121	17239	15451	18549	18968	20681	21138	21231	20973
65	20552	17772	17298	16378	16495	14714	17831	18250	19958	20407	20500	20238
66	22005	19239	18757	17817	17927	16107	19150	19567	21291	21770	21863	21619
67	13094	10385	9863	8899	9017	7322	10696	11116	12738	13076	13169	12850
68	10652	7995	7441	6446	6566	4960	8494	8909	10456	10721	10814	10459
69	15220	12502	11988	11020	11130	9364	12602	13023	14692	15088	15181	14894
7	16369	13378	13307	13177	13495	12902	16629	17012	18277	18218	18304	17751
70	12161	9496	8950	7947	8055	6340	9732	10151	11763	12094	12187	11868
71	13717	11032	10498	9504	9609	7846	11134	11555	13205	13581	13674	13377
72	11290	8659	8094	7064	7167	5457	8892	9310	10903	11216	11309	10982
73	22580	19837	19342	18374	18473	16614	19591	20006	21742	22246	22339	22113
74	14487	11863	11301	10243	10322	8447	11573	11993	13685	14123	14217	13961
75	12607	10071	9468	8344	8402	6482	9631	10052	11731	12157	12250	11993
76	11577	9080	8460	7310	7361	5442	8654	9074	10733	11135	11228	10959
77	16276	13660	13097	12025	12094	10167	13156	13573	15296	15785	15878	15653
78	15329	12738	12163	11072	11136	9199	12203	12621	14339	14821	14914	14686
79	13551	11017	10416	9286	9338	7385	10434	10854	12556	13018	13111	12875
8	7989	5783	6331	7400	7808	9165	11797	11997	12332	11693	11747	11004
80	15285	12815	12194	11013	11038	8982	11763	12176	13923	14472	14564	14386
81	15975	13539	12908	11704	11717	9625	12290	12699	14458	15042	15133	14980

To be continued on next page...

Project:

Jolkka_meluvätkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

17.2.2026 10.24/4.2.285

DECIBEL - Main Result

Calculation: VE2_Jolkka_V172x7xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

...continued from previous page

WTG	A	B	C	D	E	F	G	H	I	J	K	L
82	22926	20121	19664	18767	18890	17118	20217	20635	22350	22808	22901	22641
83	23382	20628	20140	19183	19285	17434	20413	20828	22564	23068	23161	22934
84	24285	21541	21047	20077	20173	18300	21233	21647	23390	23912	24004	23789
85	23242	20568	20037	19000	19074	17125	19939	20349	22105	22666	22758	22573
86	24405	21716	21193	20168	20245	18305	21119	21528	23286	23848	23940	23755
87	8831	6308	5686	4584	4678	3096	6735	7140	8621	8839	8932	8560
88	9804	7255	6649	5557	5646	3950	7478	7892	9438	9713	9806	9463
89	9309	6867	6218	5041	5096	3293	6790	7204	8759	9053	9146	8819
9	8677	6213	6652	7539	7953	9052	11953	12186	12674	12117	12177	11451
90	9021	6729	6034	4754	4759	2777	6160	6577	8164	8503	8596	8303
91	9402	6775	6202	5195	5321	3829	7470	7876	9356	9563	9655	9272
92	9946	7541	6884	5675	5709	3784	7119	7538	9150	9507	9600	9310
WTG 2	1846	2830	2606	2953	2817	4890	4430	4396	4000	3187	3231	2476
WTG 3	2352	2766	2391	2497	2322	4348	4026	4030	3840	3152	3209	2482
WTG 4	2306	3554	3261	3355	3139	4988	3952	3862	3293	2443	2485	1729
WTG 5	3229	3309	2752	2322	2020	3705	3165	3202	3273	2809	2884	2260
WTG 6	3860	4045	3444	2768	2401	3617	2424	2442	2618	2349	2434	1954
WTG 7	4083	3706	3017	2117	1726	2929	2561	2695	3238	3074	3162	2690
WTG 8	4656	3964	3212	2044	1629	2347	2382	2607	3487	3498	3589	3198

DECIBEL - Assumptions for noise calculation

Calculation: VE2_Jolkka_V172x7xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

Noise calculation model:

ISO 9613-2:2024 Finland

Wind speed (at 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_Jolkka_meluvälkemallinnus_0.w2r (1)

Area type with hard ground: vesisto_meluvalke

Ground factor for hard ground: 0,0

Meteorological coefficient, C0:

Selected option: Fixed value: 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:

Pure tones penalty is added to total noise impact at receptors

Noise sensitive area

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:

Uncertainty added to source noise level of the WTGs in the calculation

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

0,0 dB(A)

Octave data required

Input parameters for calculation of air absorption:

Temperature 15,0 °C

Relative humidity 70,0 %

Pressure 101,325 kPa

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]
0,1	0,4	1,1	2,4	4,1	8,7	26,4	93,7

All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

WTG: GE WIND ENERGY GE158 - 6.1 MW 6100 158.0 !O!

Noise: GE 6.1.158 no STE 107.0 dB + 2dB + 1 dB

Source

Source/Date Creator Edited

Noise_Emission_4.x_5.x_6.x-158-50Hz_IEC_EN_r01 30.5.2018 USER 26.9.2025 14.18

Octave data

Status	Hub height	Wind speed	LwA,ref	Pure tones	63	125	250	500	1000	2000	4000	8000
	[m]	[m/s]	[dB(A)]		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	221,0	8,0	110,0	No	91,2	96,4	100,9	103,4	105,4	103,3	95,8	79,8

WTG: NORDEX N175 6500 175.0 !O!

Noise: Mode 0 STE 106.9 dB + 1.5 dB

Source

Source/Date Creator Edited

F008_278_A17_EN Revision 01, 2022-05-08 28.10.2024 USER 10.1.2025 15.52

Octave data

Status	Hub height	Wind speed	LwA,ref	Pure tones	63	125	250	500	1000	2000	4000	8000
	[m]	[m/s]	[dB(A)]		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
From Windcat	212,5	8,0	108,4	No	91,2	98,0	101,4	101,9	102,8	100,7	91,4	74,9

DECIBEL - Assumptions for noise calculation

Calculation: VE2_Jolkka_V172x7xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

WTG: VESTAS V172-7.2 7200 172.0 !O!

Noise: V172 - 7,2 MW PO7200 STE

Source	Source/Date	Creator	Edited
Manufacturer DMS no.: 0128-4336_01	29.11.2024	USER	13.10.2025 15.56

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	209,0	8,0	107,8	No	89,8	96,8	101,4	100,4	101,0	99,9	98,3	85,5

Noise sensitive area: A A - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: B B - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: C C - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: D D - Lomarakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: E E - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: F F - Lomarakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

DECIBEL - Assumptions for noise calculation

Calculation: VE2_Jolkka_V172x7xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

Noise sensitive area: G G - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: H H - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: I I - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: J J - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: K K - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

Noise sensitive area: L L - Asuinrakennus

Predefined calculation standard:

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

Uncertainty margin: Use default value from calculation model

No temporal binning

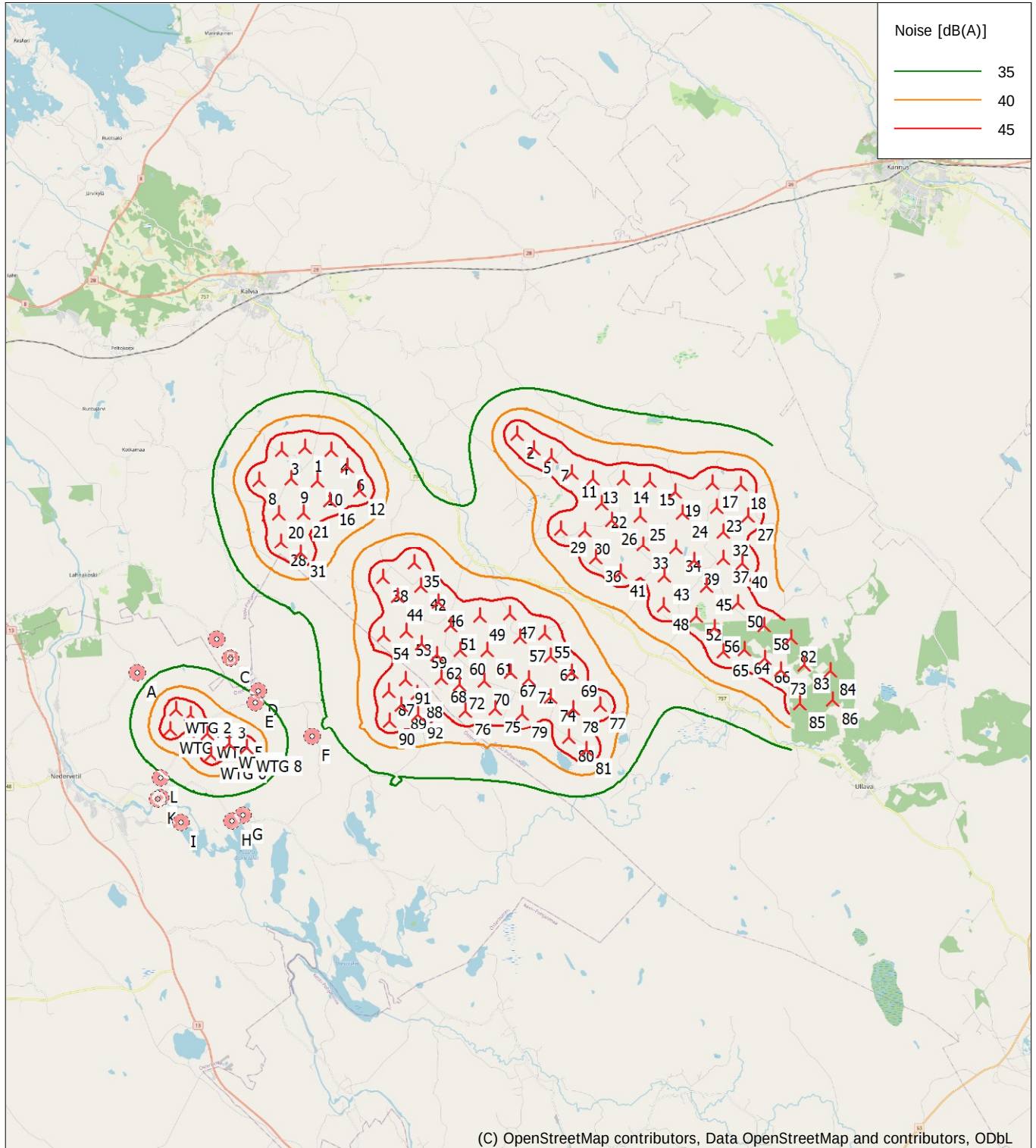
Noise demand: 40,0 dB(A)

No distance demand

Pure tone penalty: 0 dB

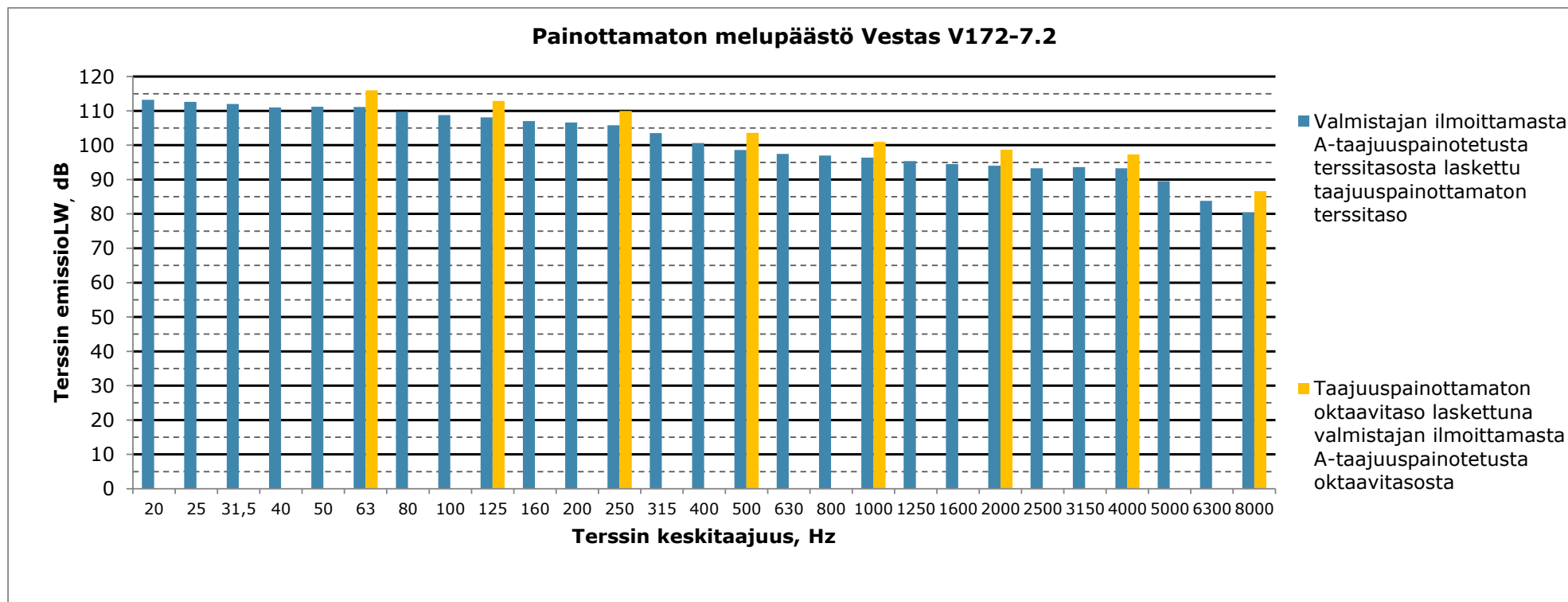
DECIBEL - Map 8,0 m/s

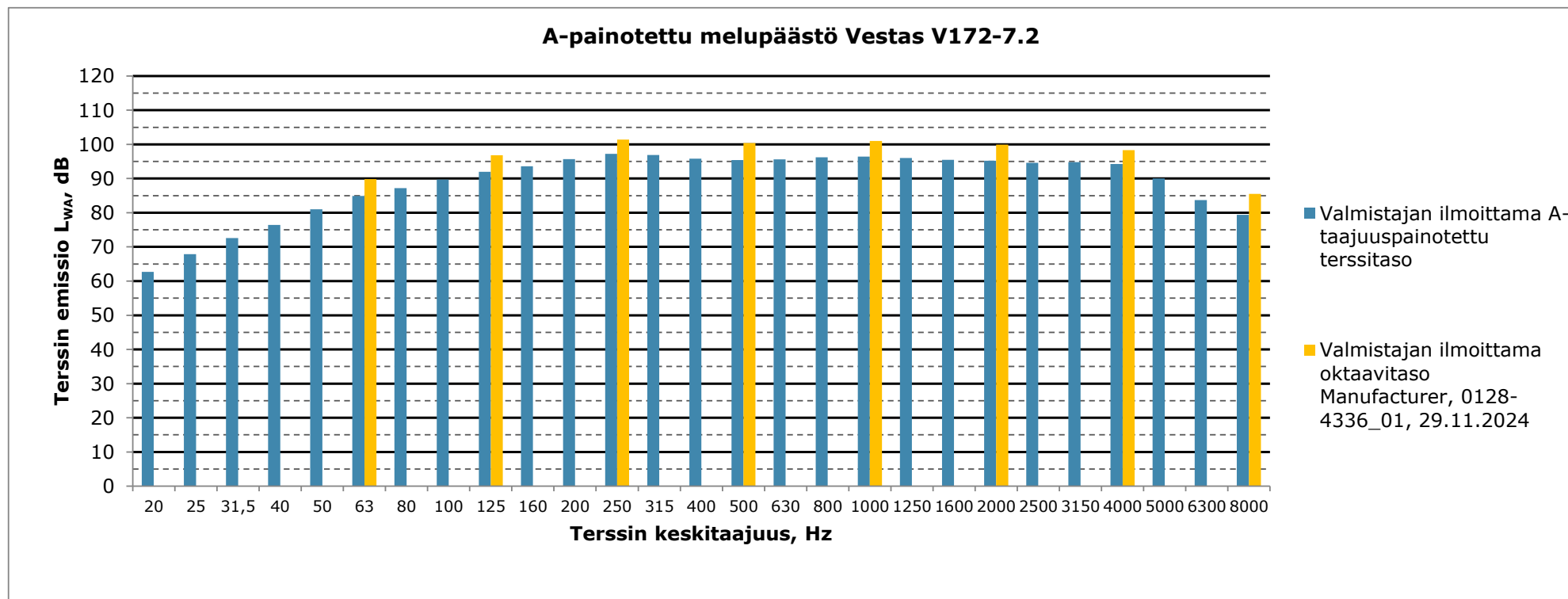
Calculation: VE2_Jolkka_V172x7xHH209 + Pihtineva_VE1_GE158-6.1x86xHH221 + Saaruka_N175x6xHH212.5_291025

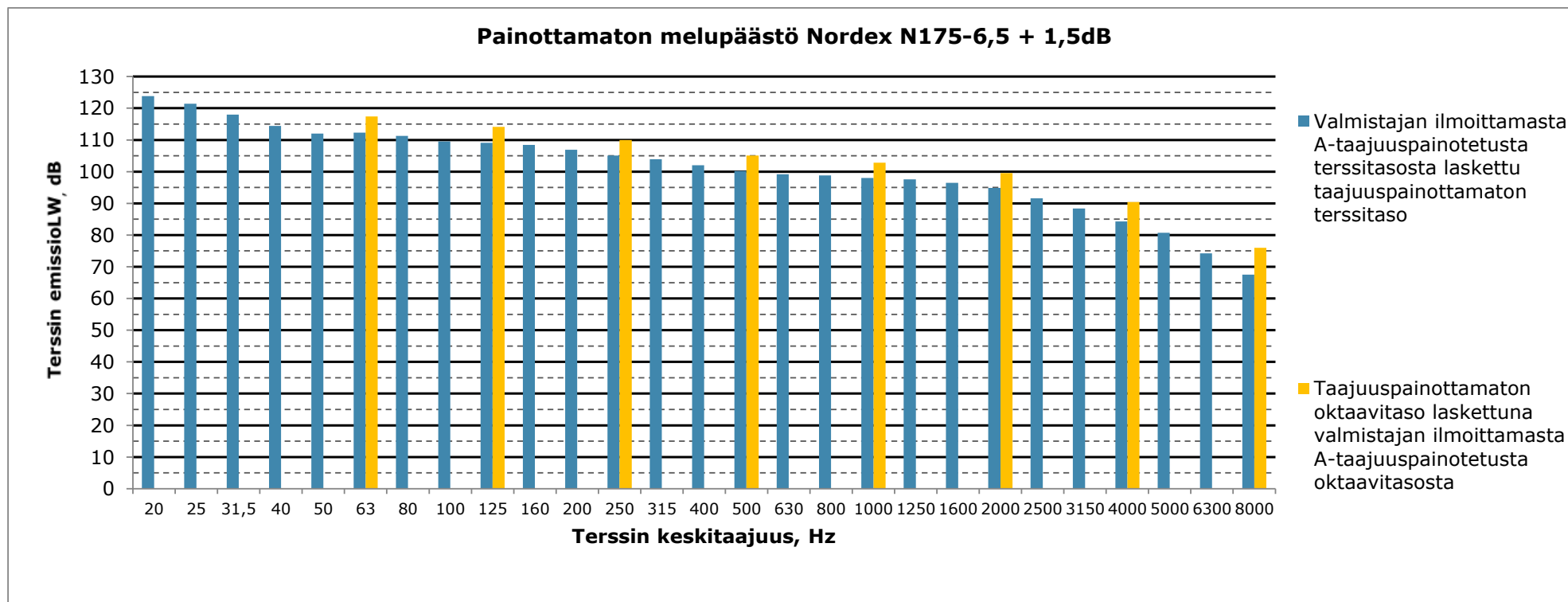


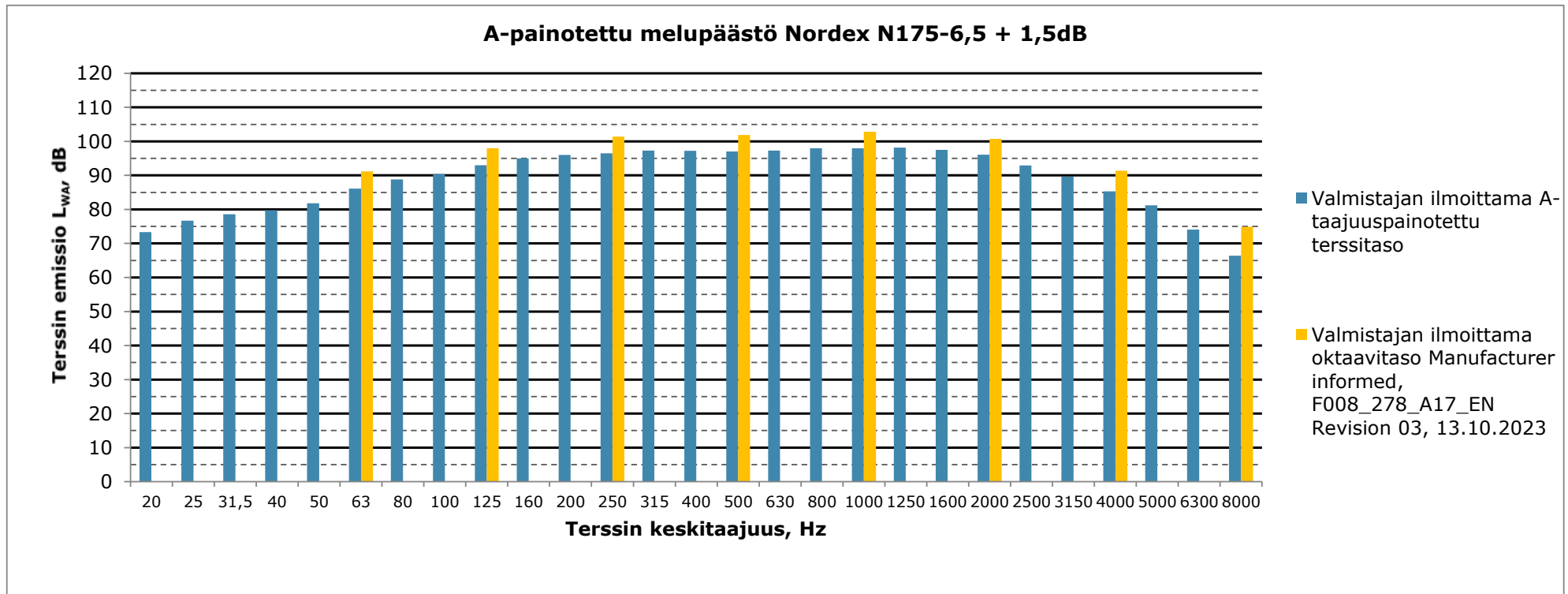
Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 333 867 North: 7 075 343
New WTG Noise sensitive area
Noise calculation model: ISO 9613-2:2024 Finland. Wind speed: 8,0 m/s
Height above sea level from active line object

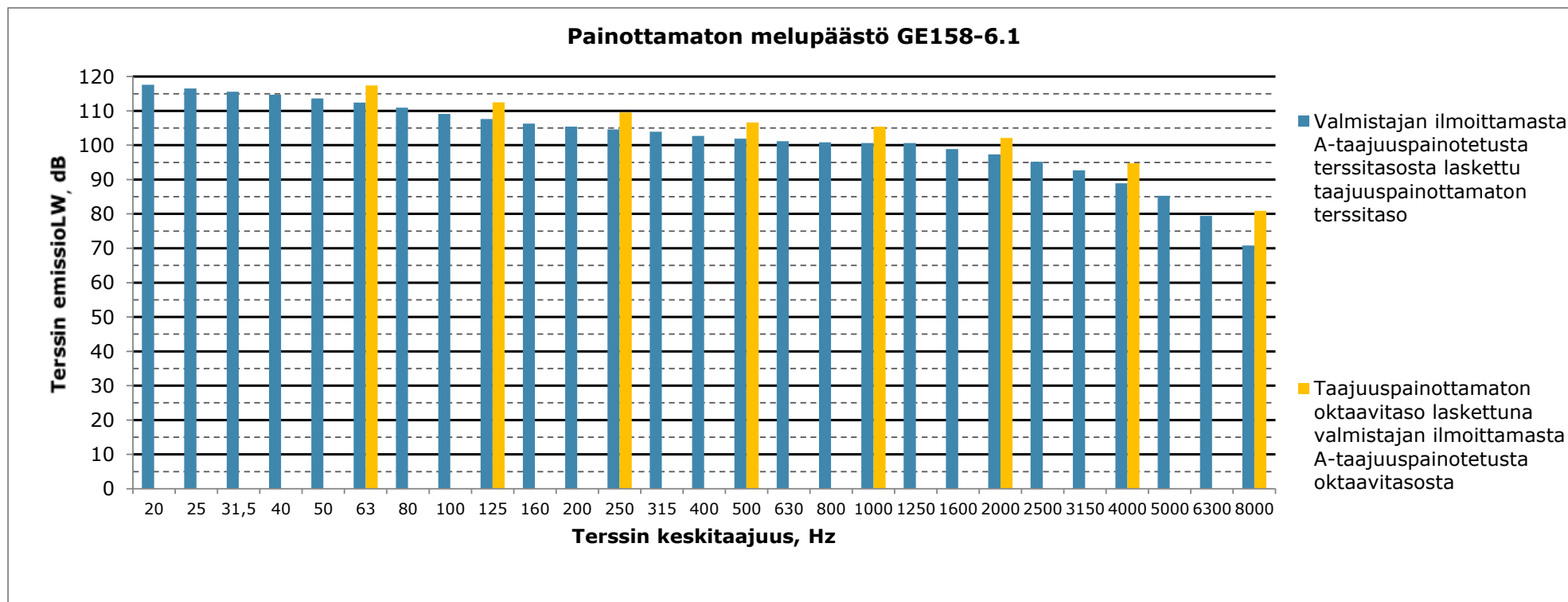
Bilaga 11. Värden för sammantaget buller vid olika byggnader - Projektalternativ ALT1

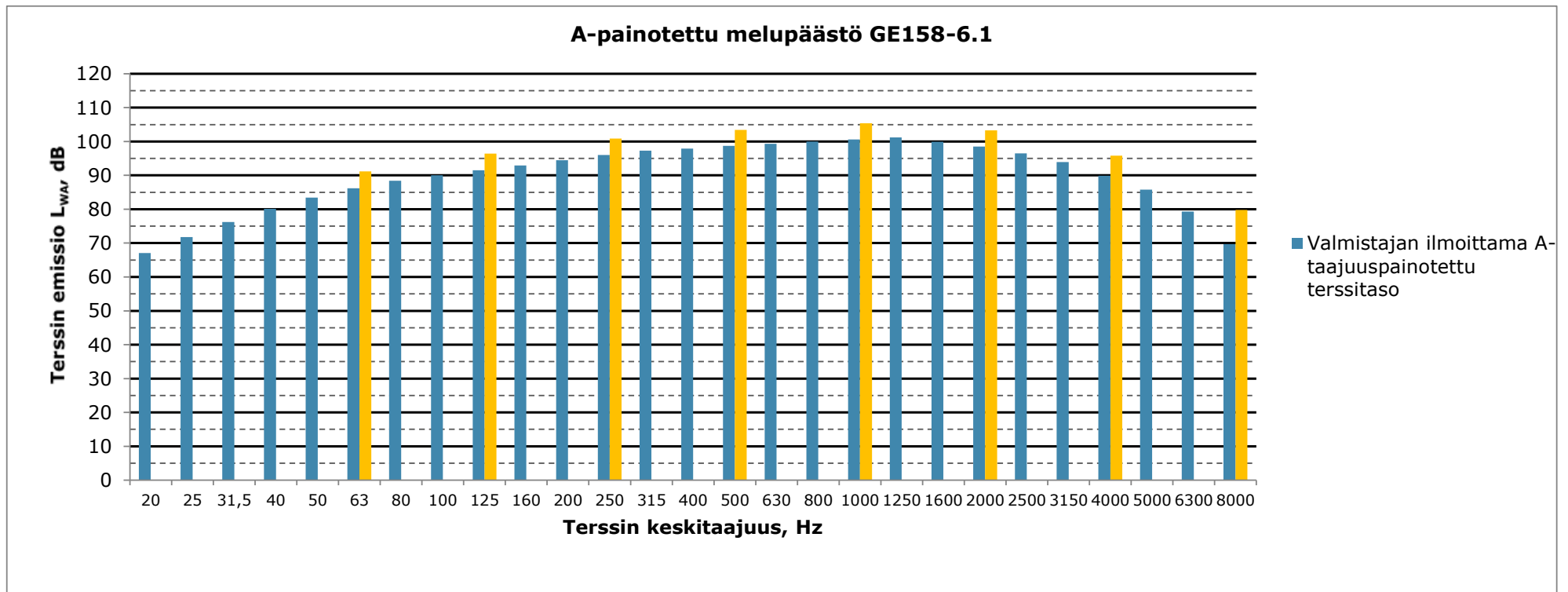




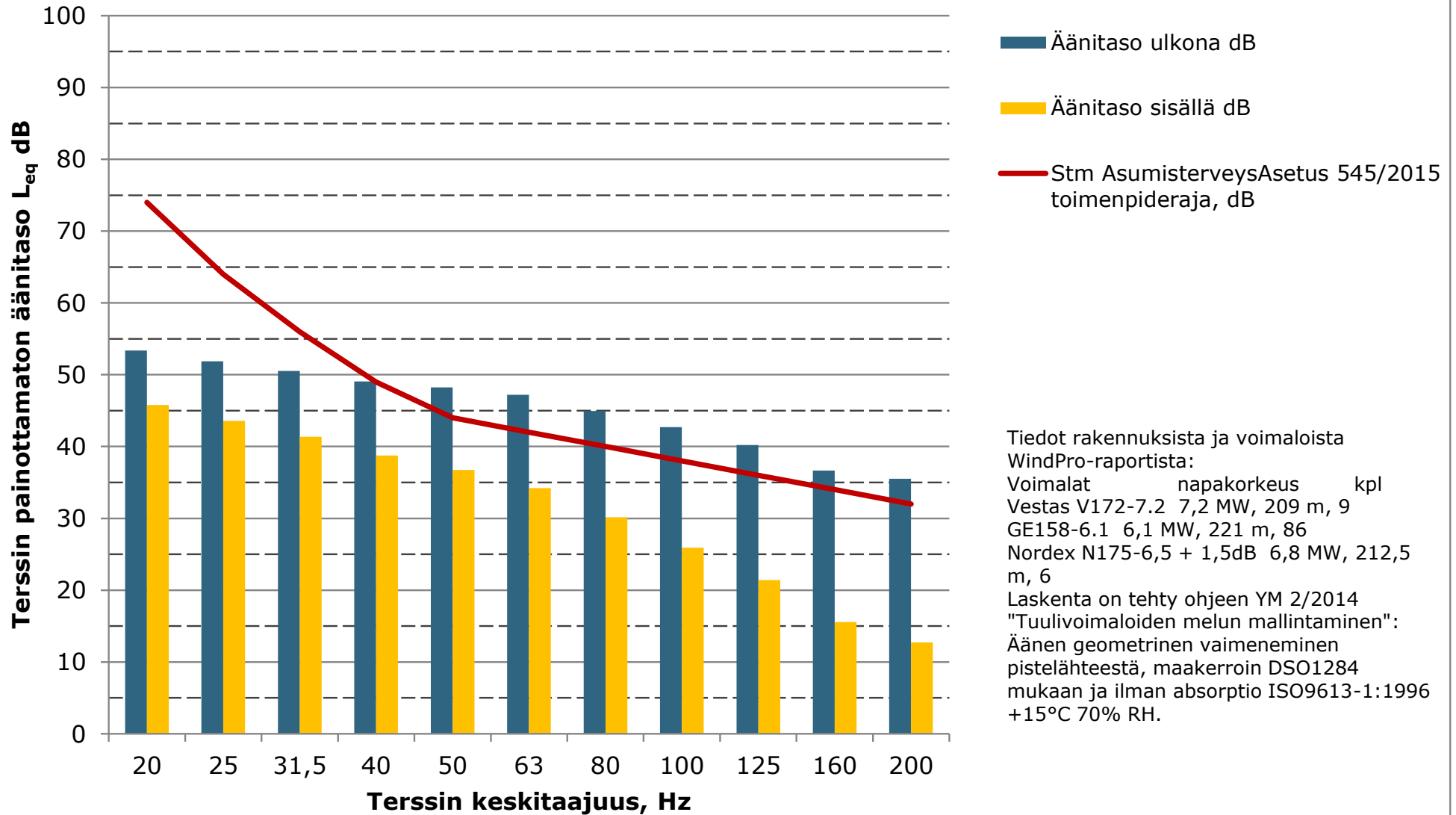




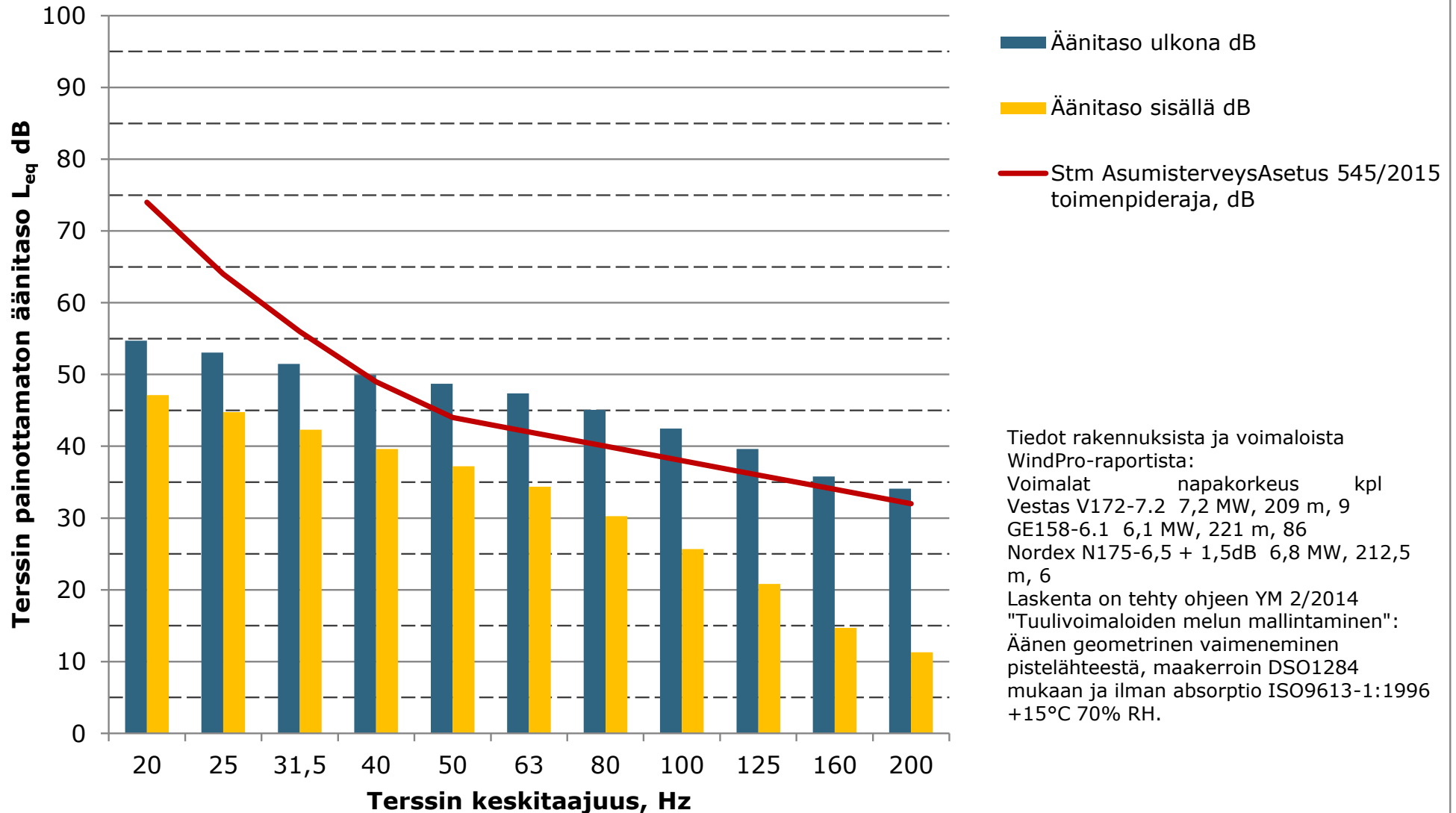




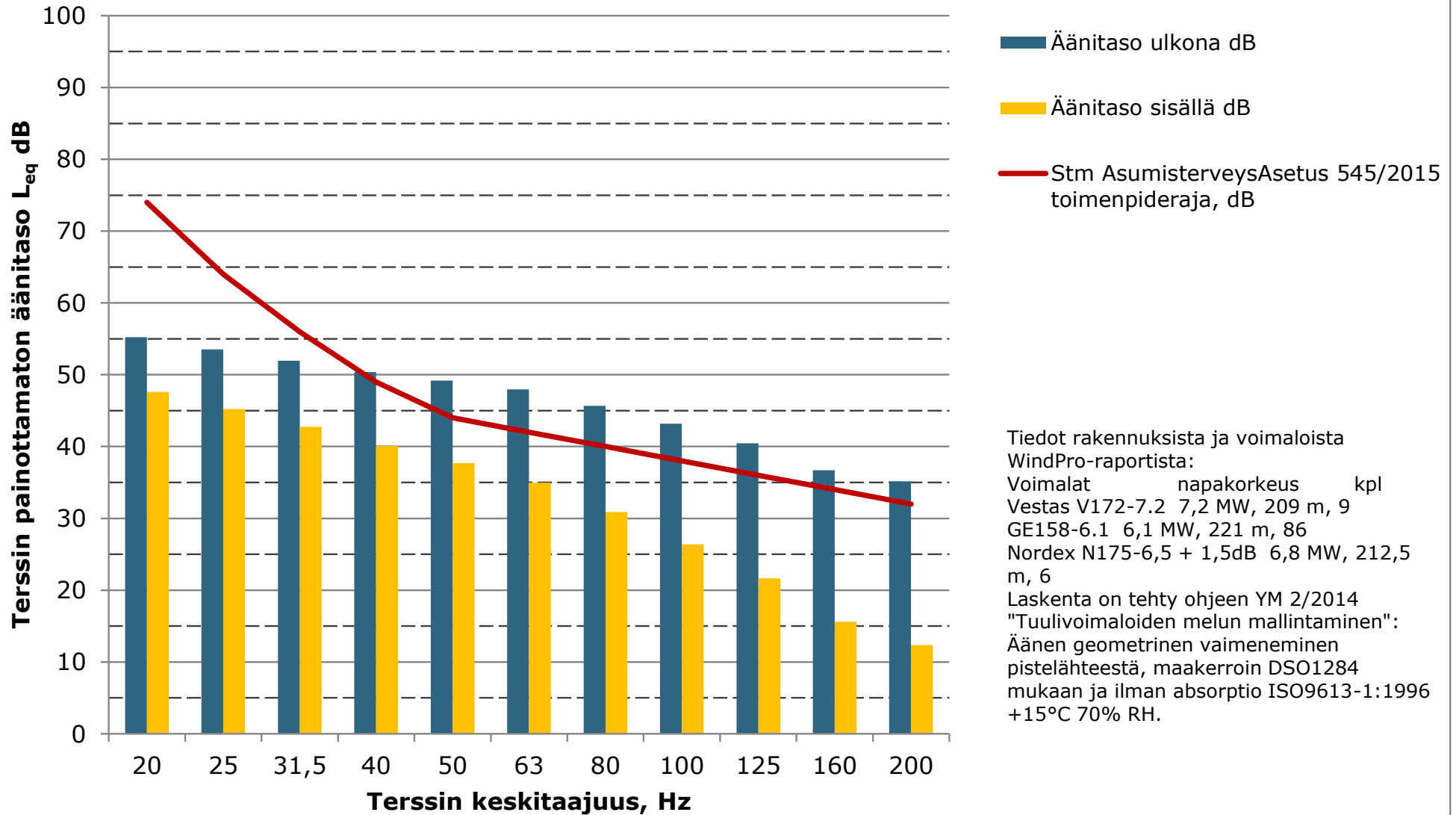
**Matalien taajuuksien äänitasot ulkona ja sisällä, A - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



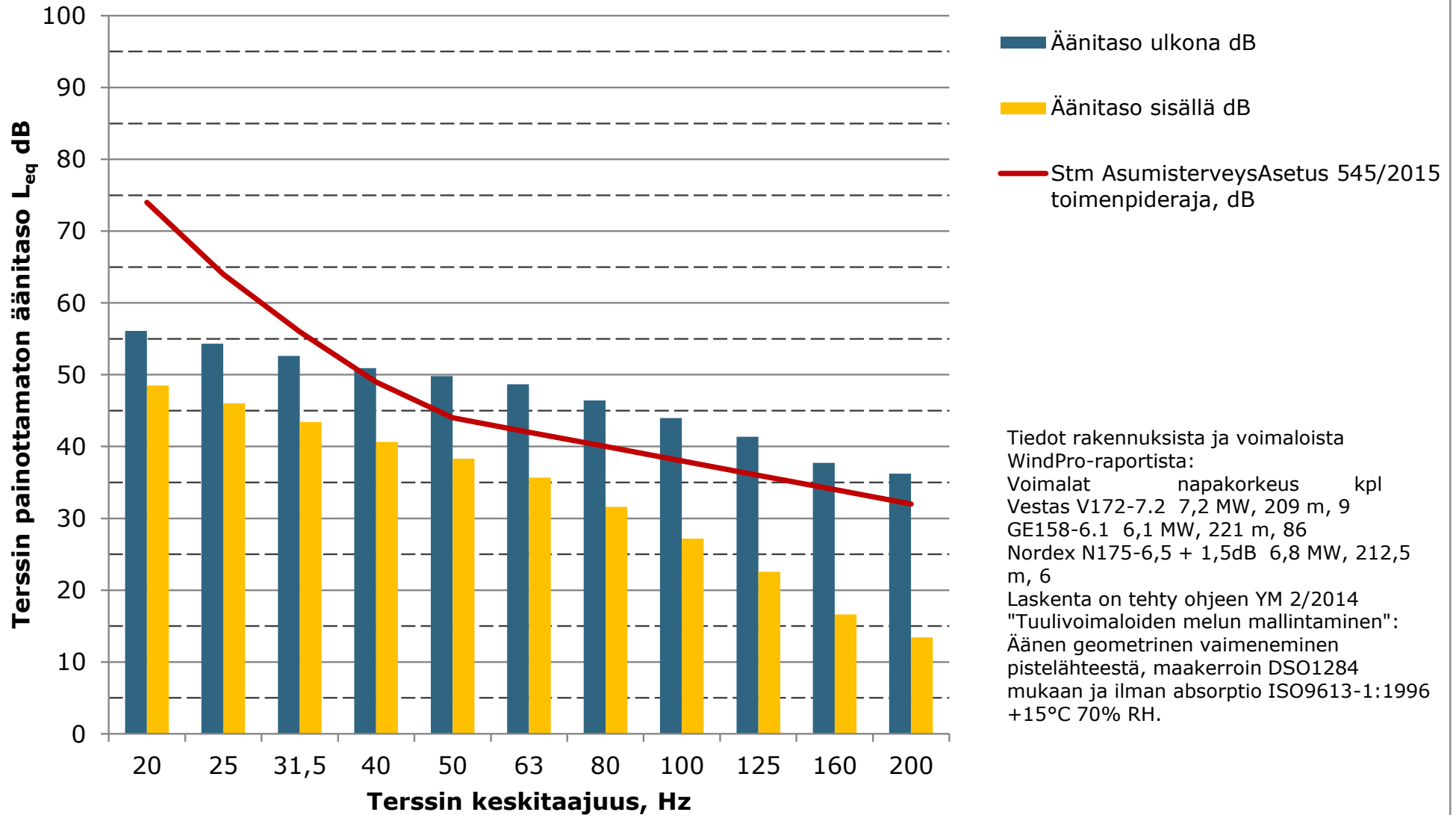
**Matalien taajuuksien äänitasot ulkona ja sisällä, B - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



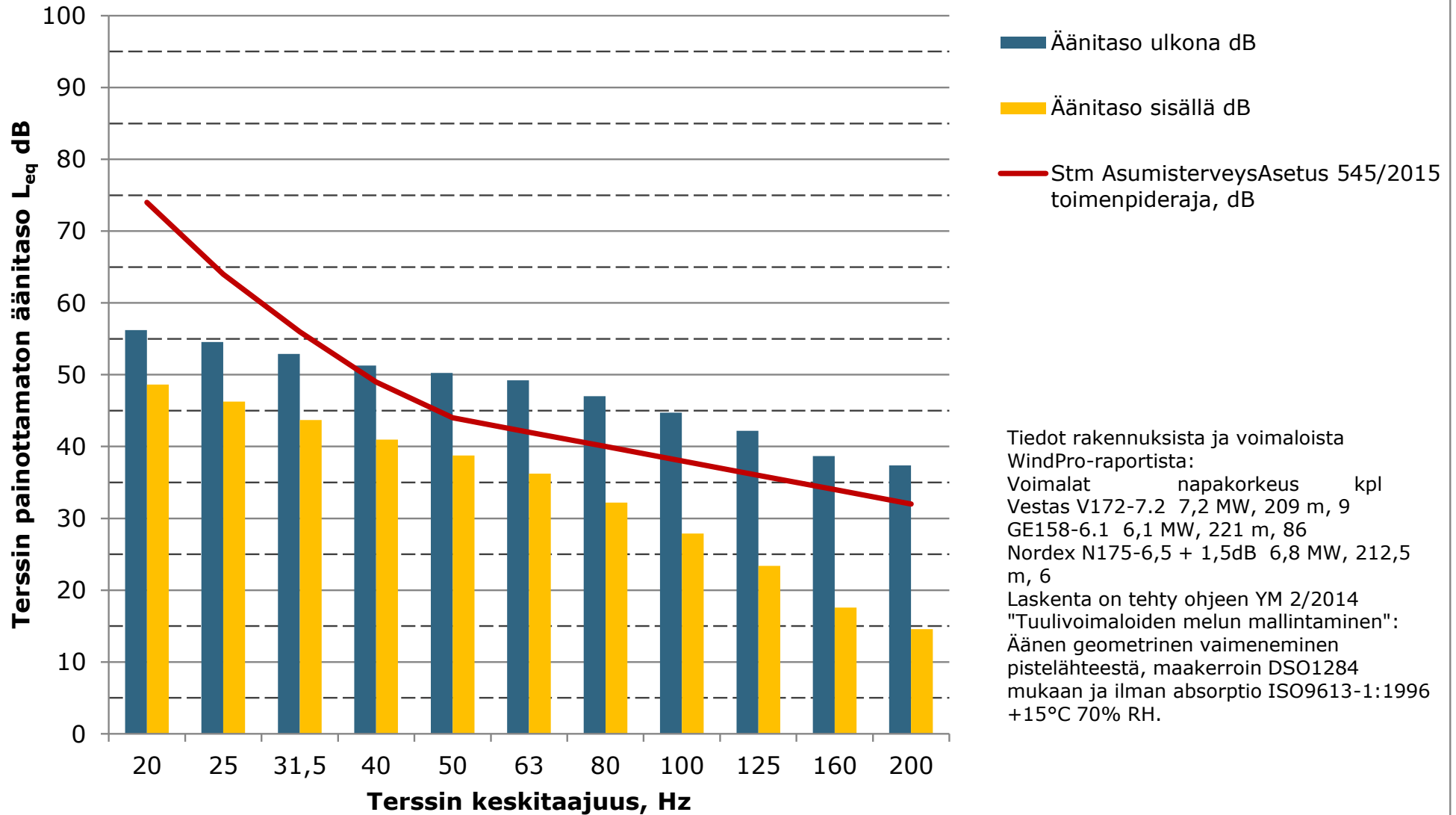
**Matalien taajuuksien äänitasot ulkona ja sisällä, C - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



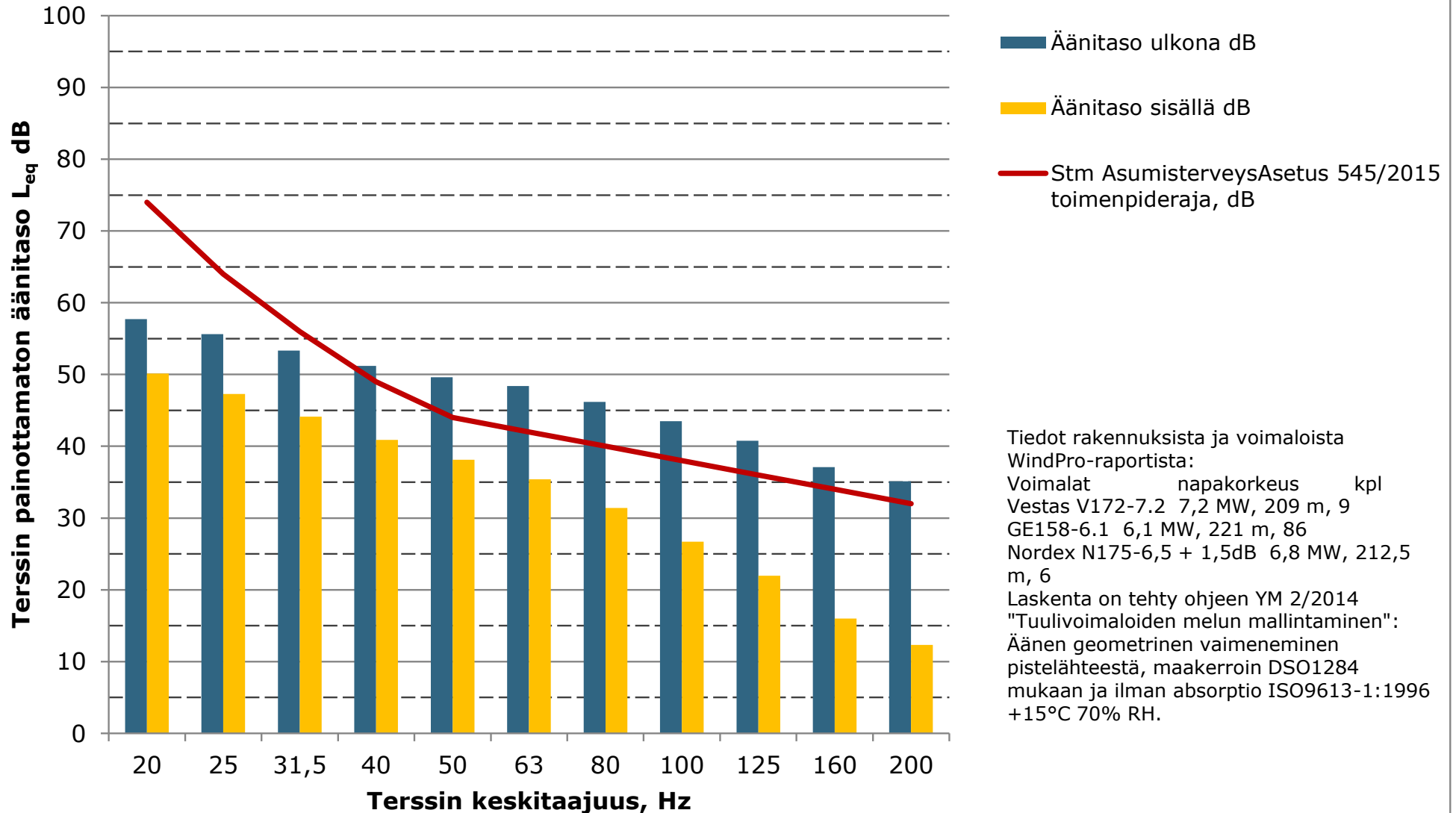
**Matalien taajuuksien äänitasot ulkona ja sisällä, D - Lomarakenus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



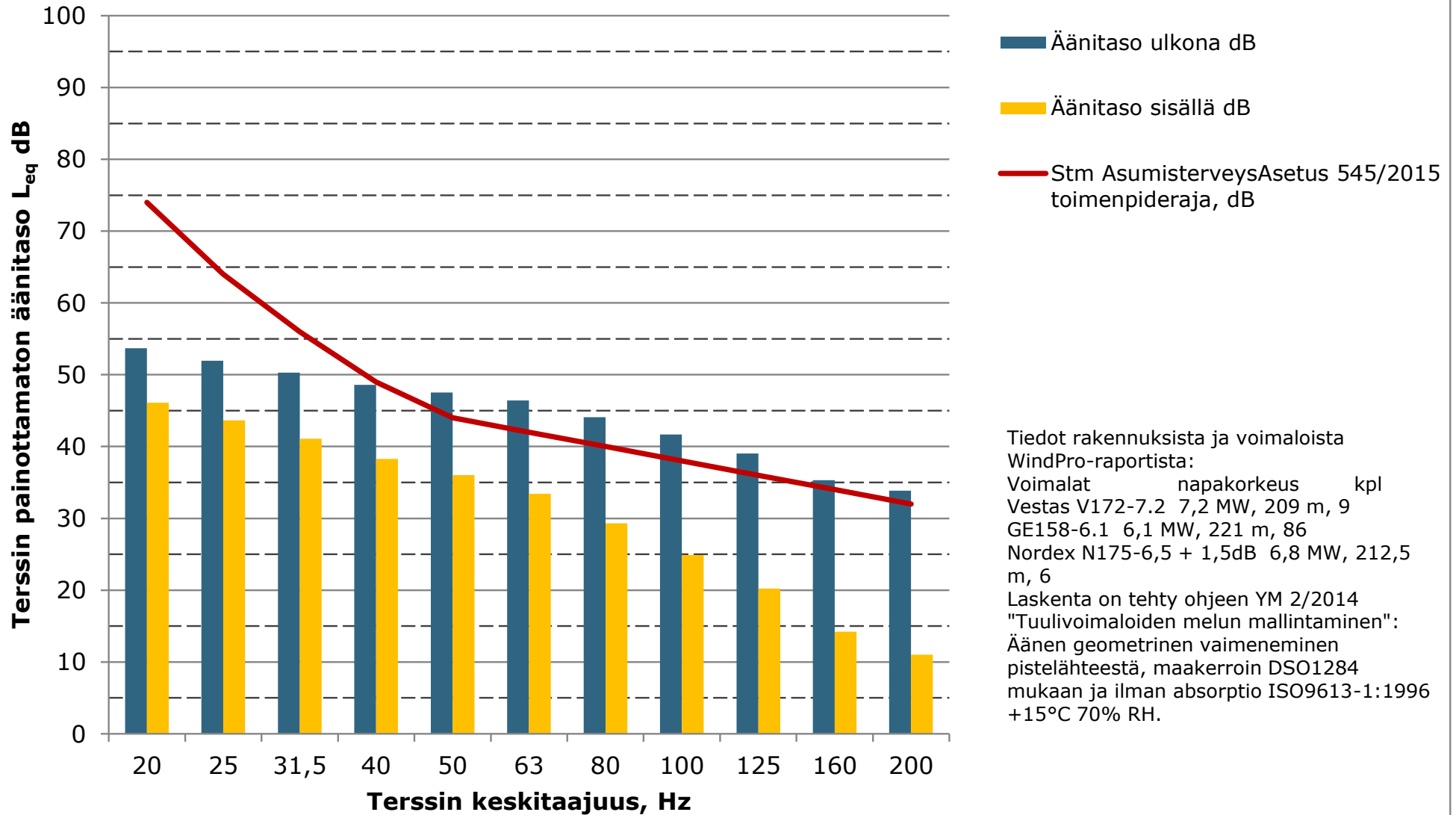
**Matalien taajuuksien äänitasot ulkona ja sisällä, E - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



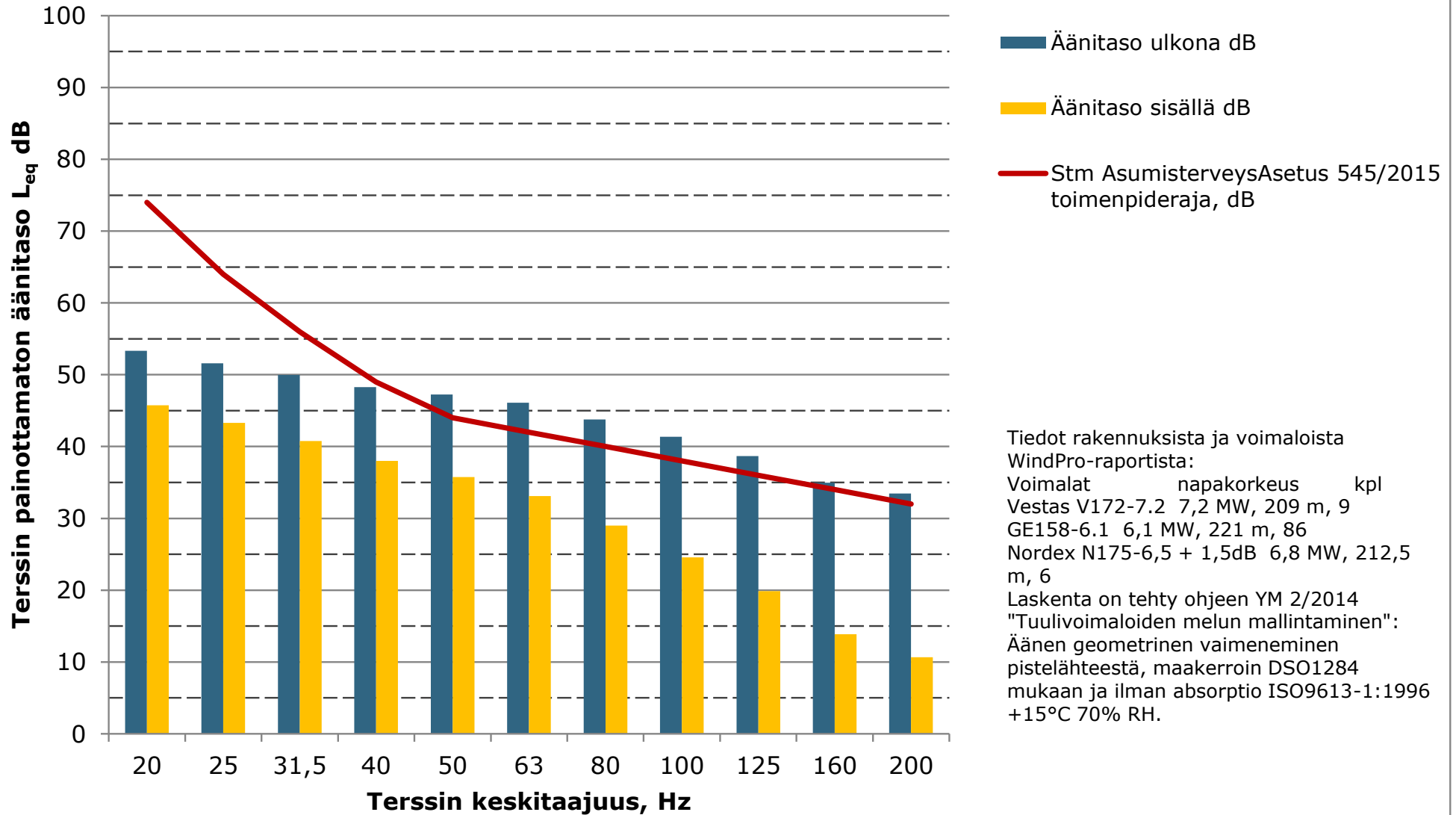
**Matalien taajuuksien äänitasot ulkona ja sisällä, F - Lomarakenus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



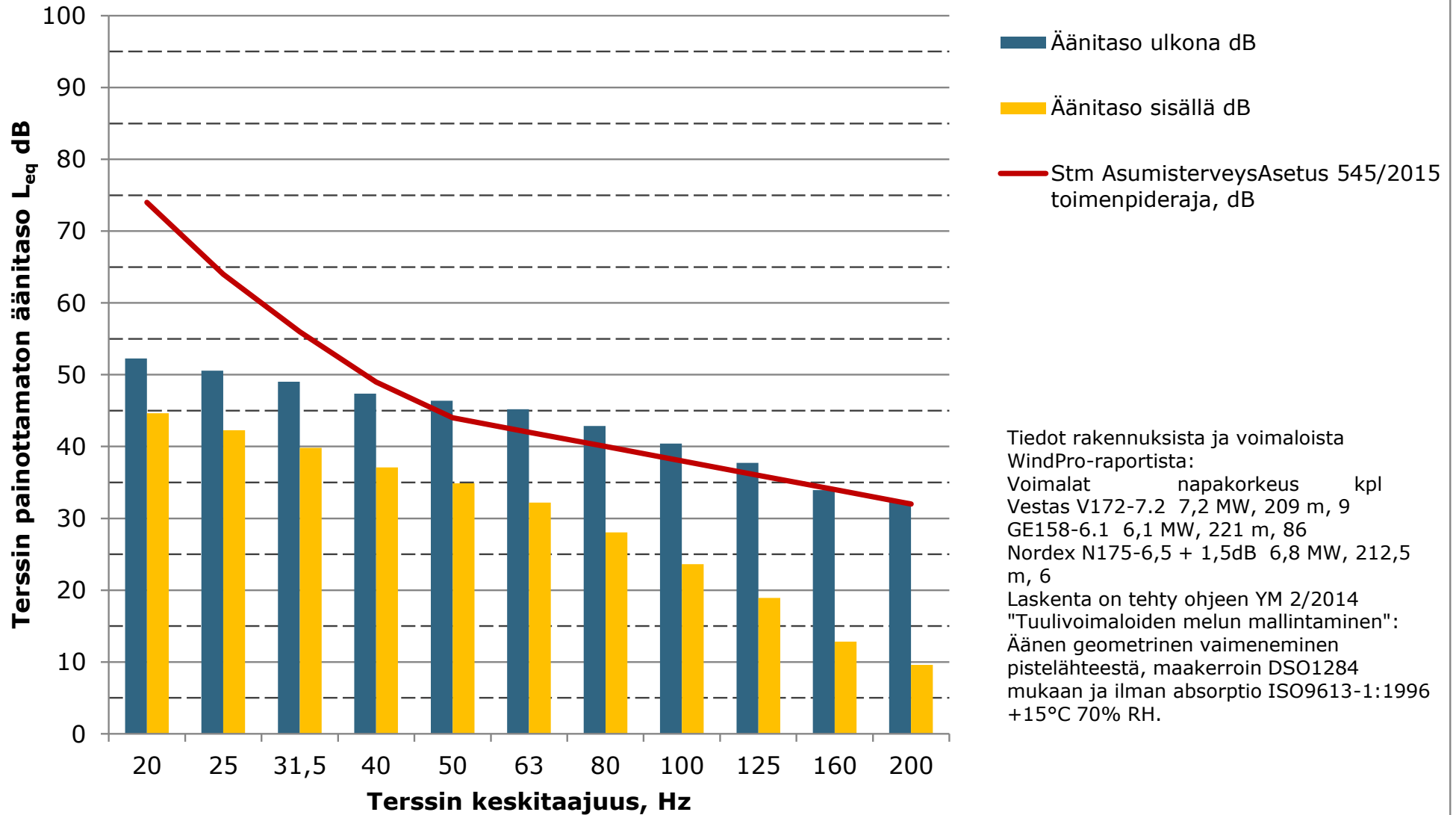
**Matalien taajuuksien äänitasot ulkona ja sisällä, G - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



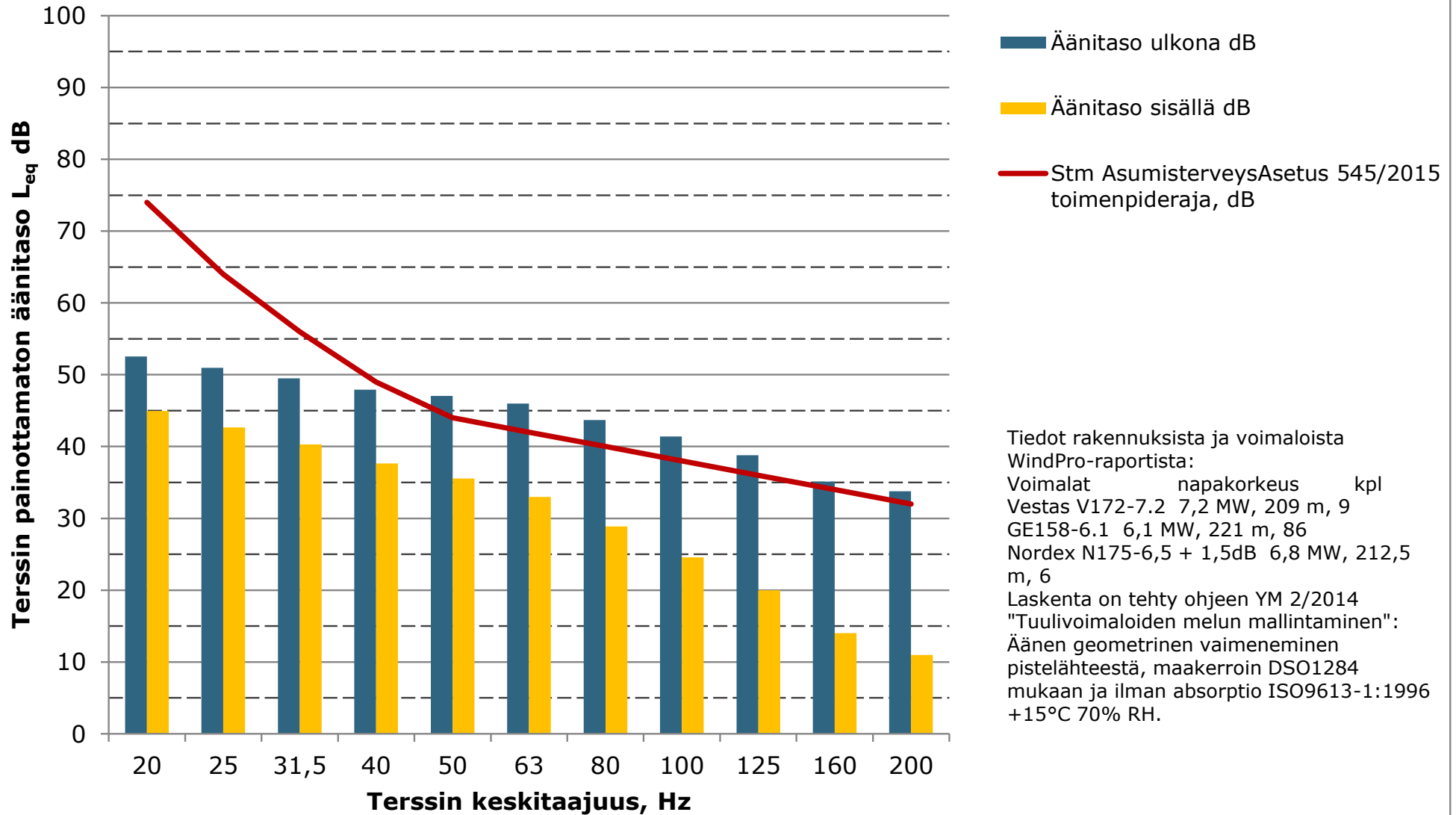
**Matalien taajuuksien äänitasot ulkona ja sisällä, H - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



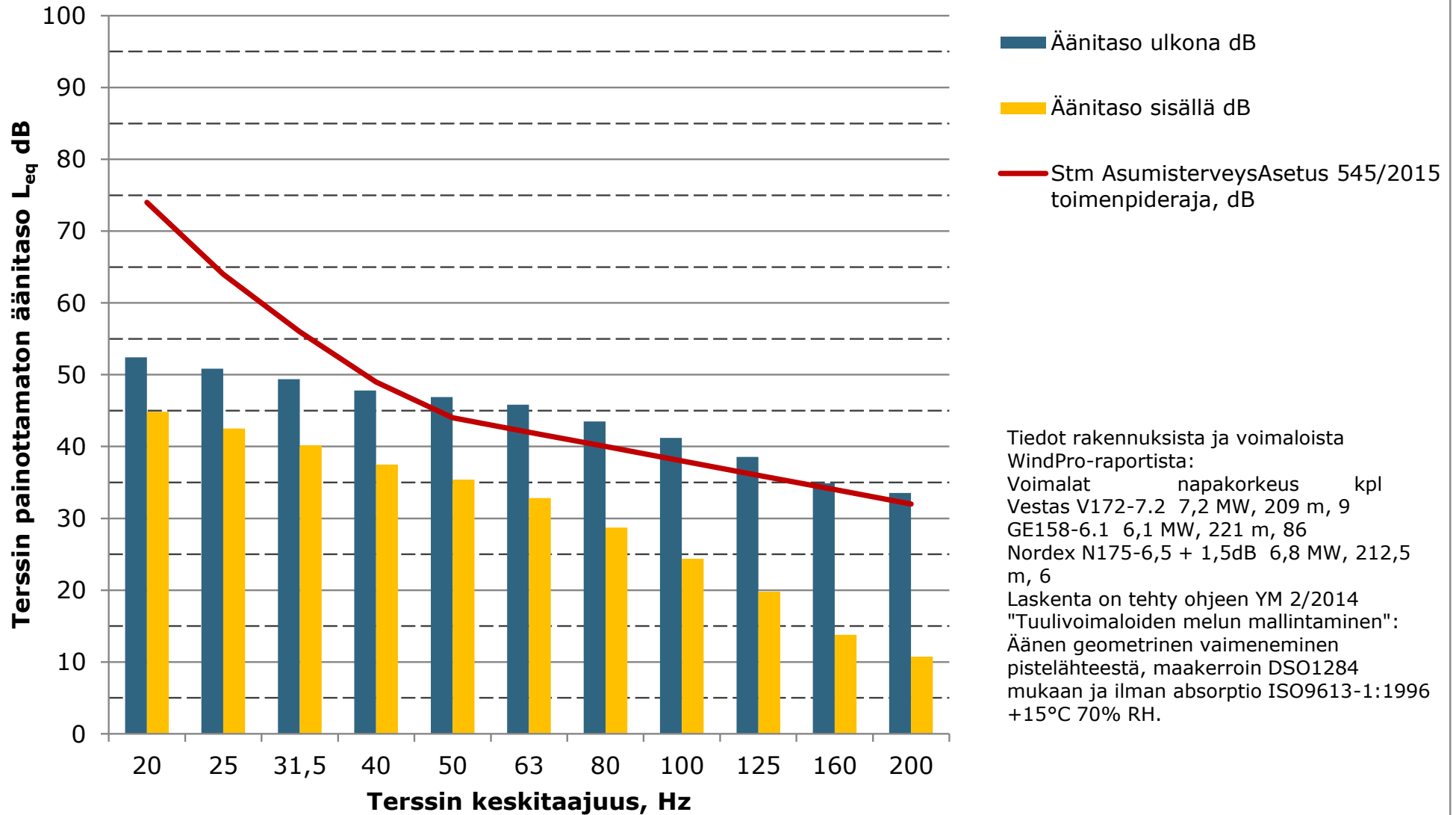
**Matalien taajuuksien äänitasot ulkona ja sisällä, I - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



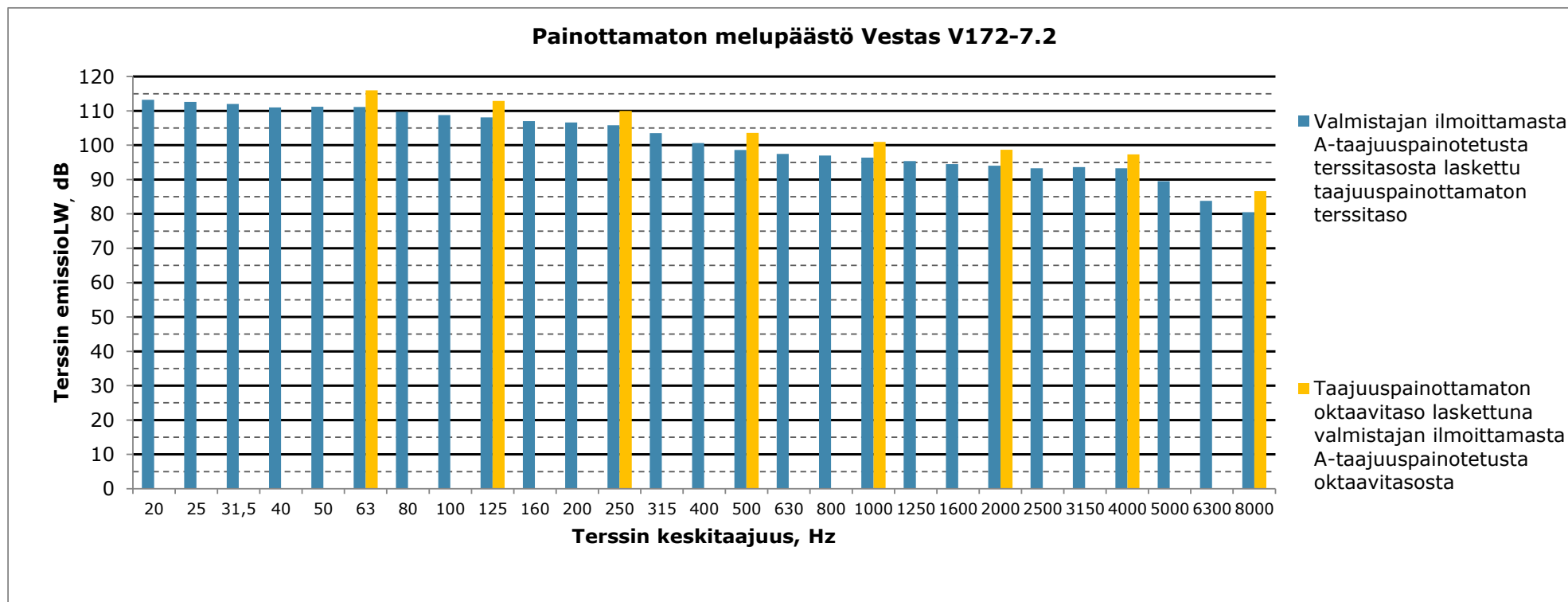
**Matalien taajuuksien äänitasot ulkona ja sisällä, J - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**

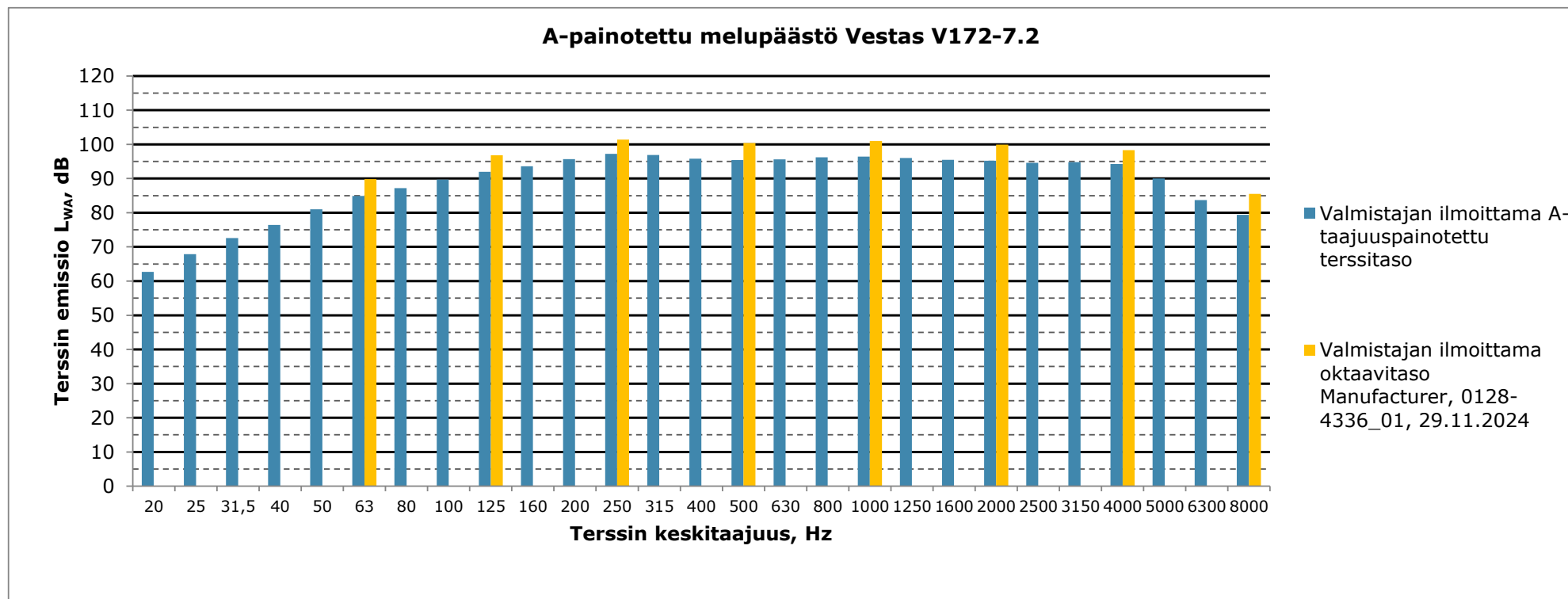


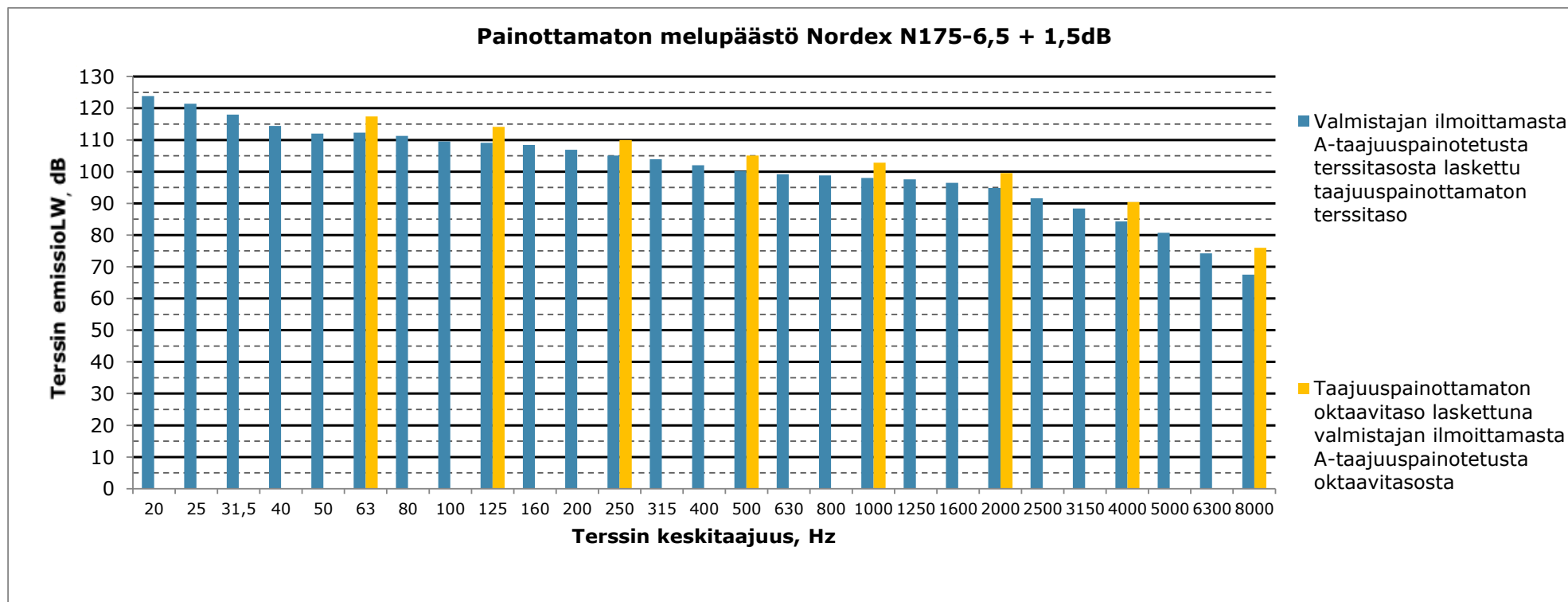
**Matalien taajuuksien äänitasot ulkona ja sisällä, K - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**

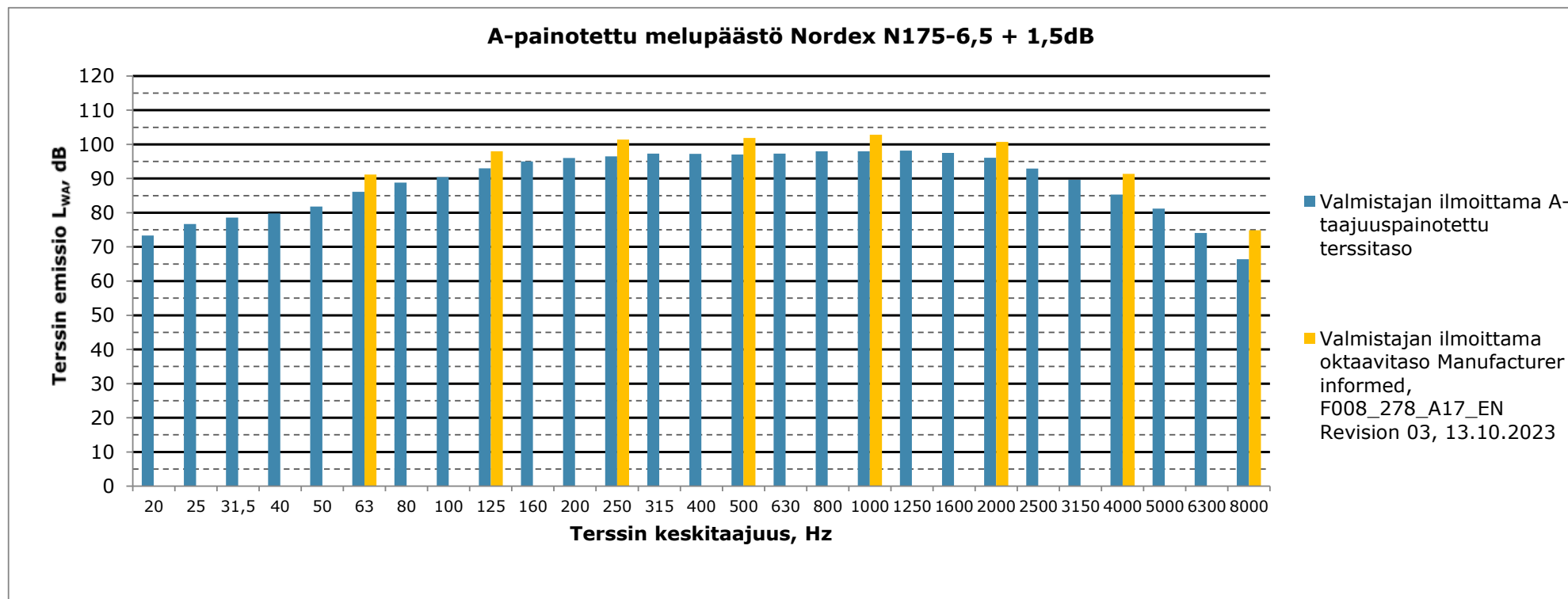


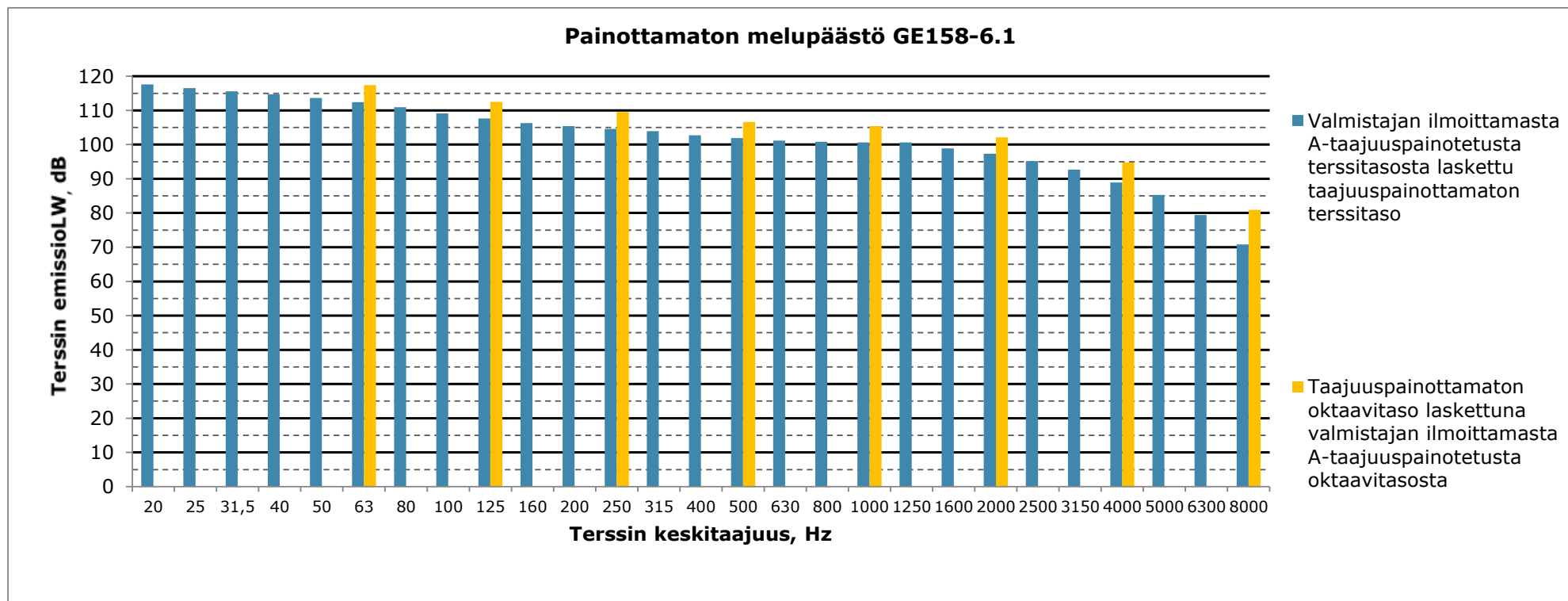
Bilaga 12. Värden för sammantaget buller vid olika byggnader - Projektalternativ ALT2

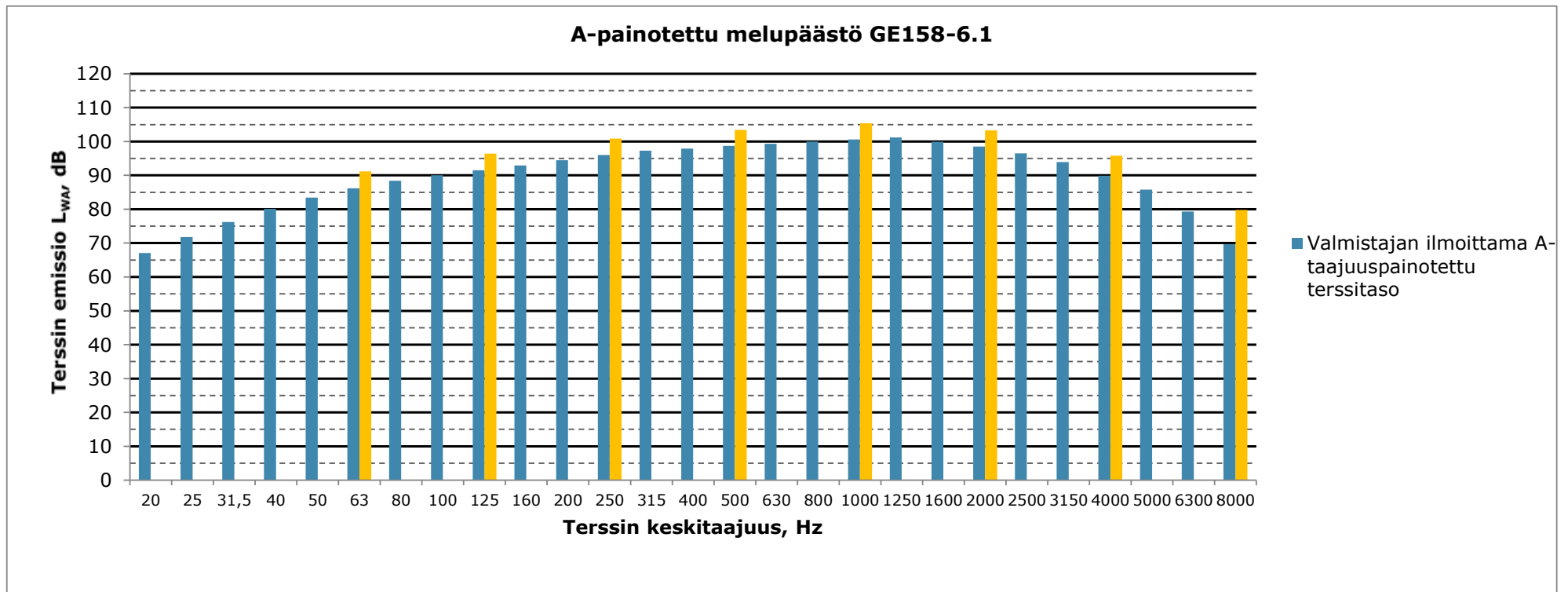




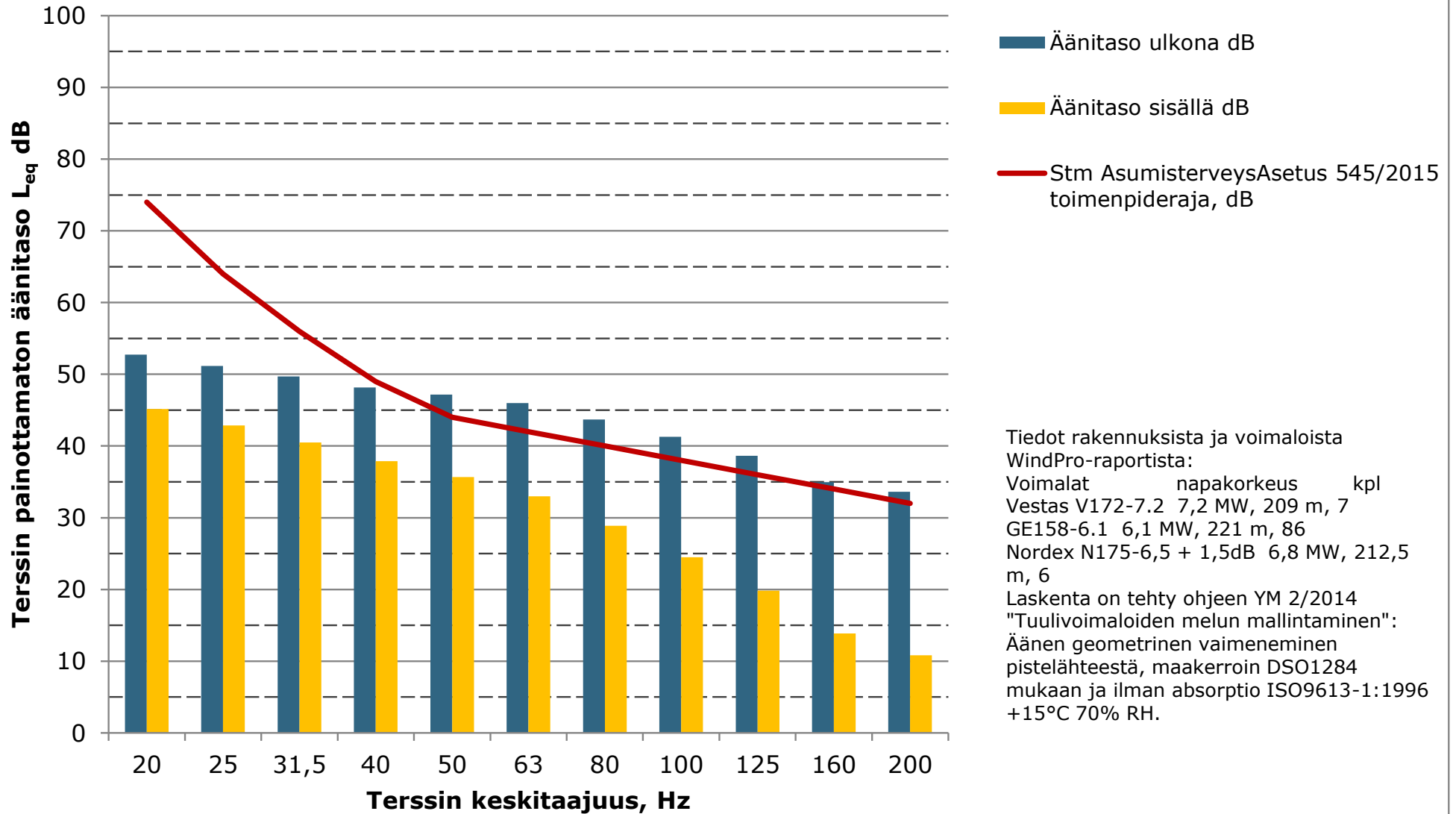




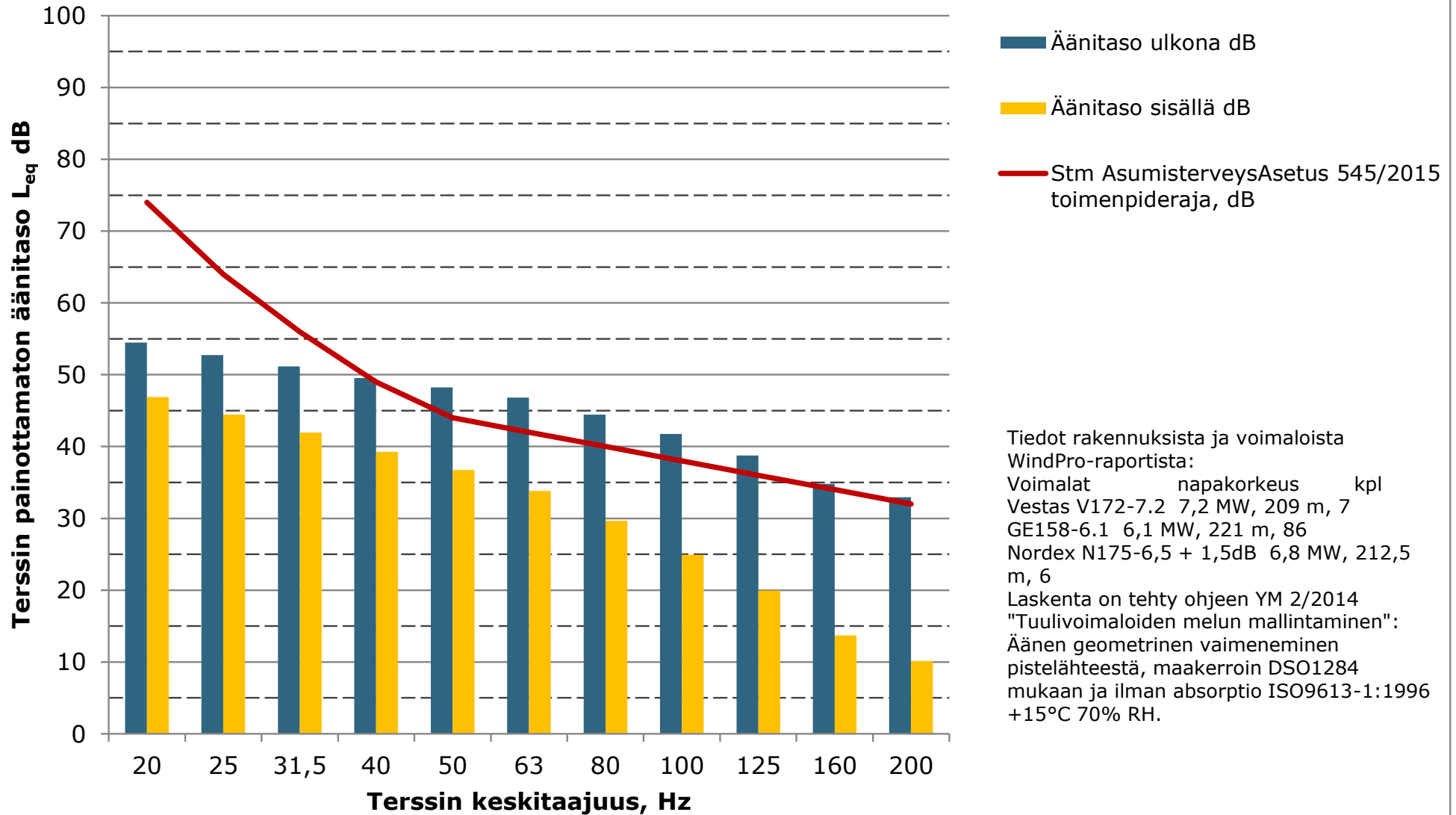




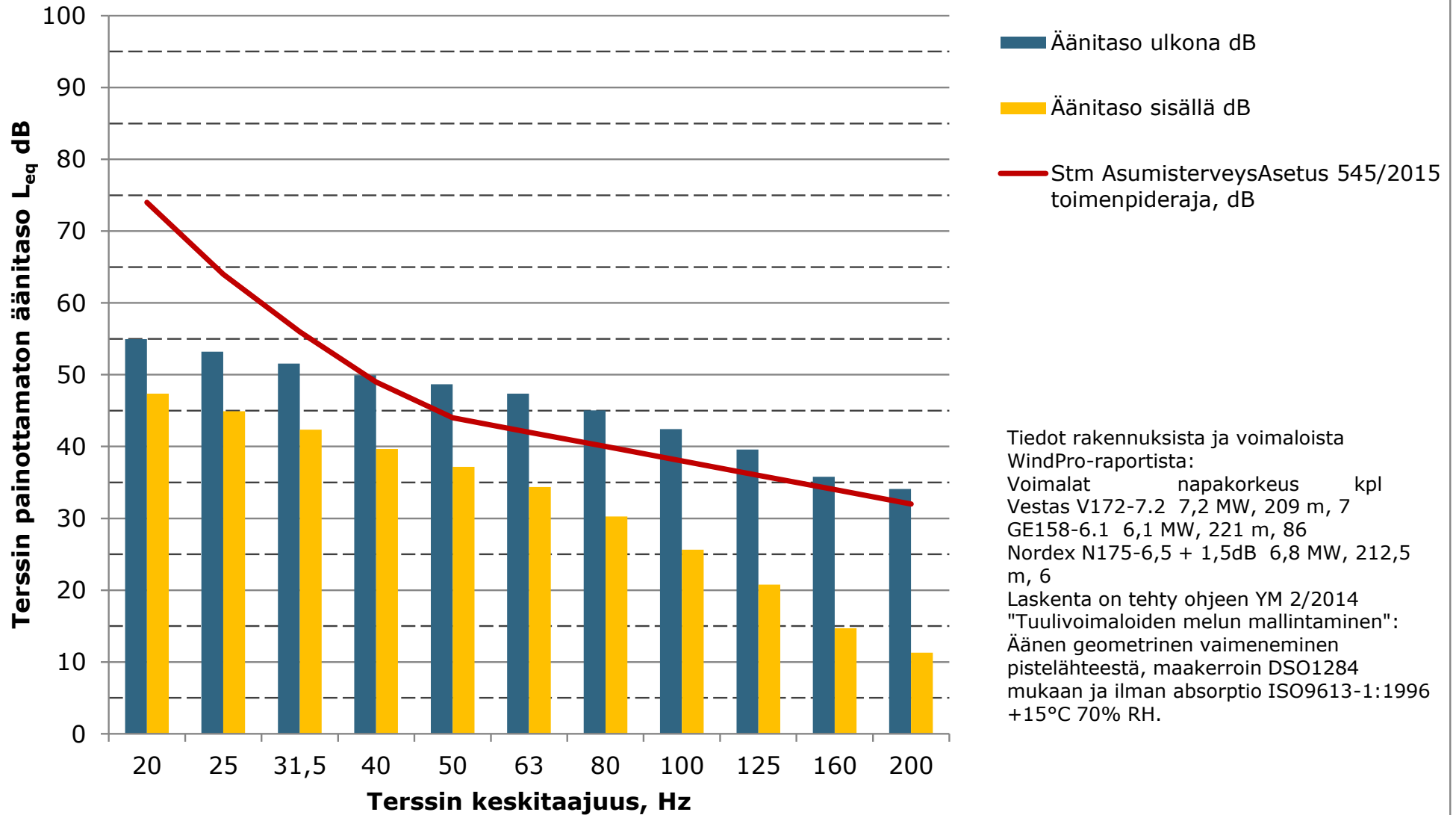
**Matalien taajuuksien äänitasot ulkona ja sisällä, A - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



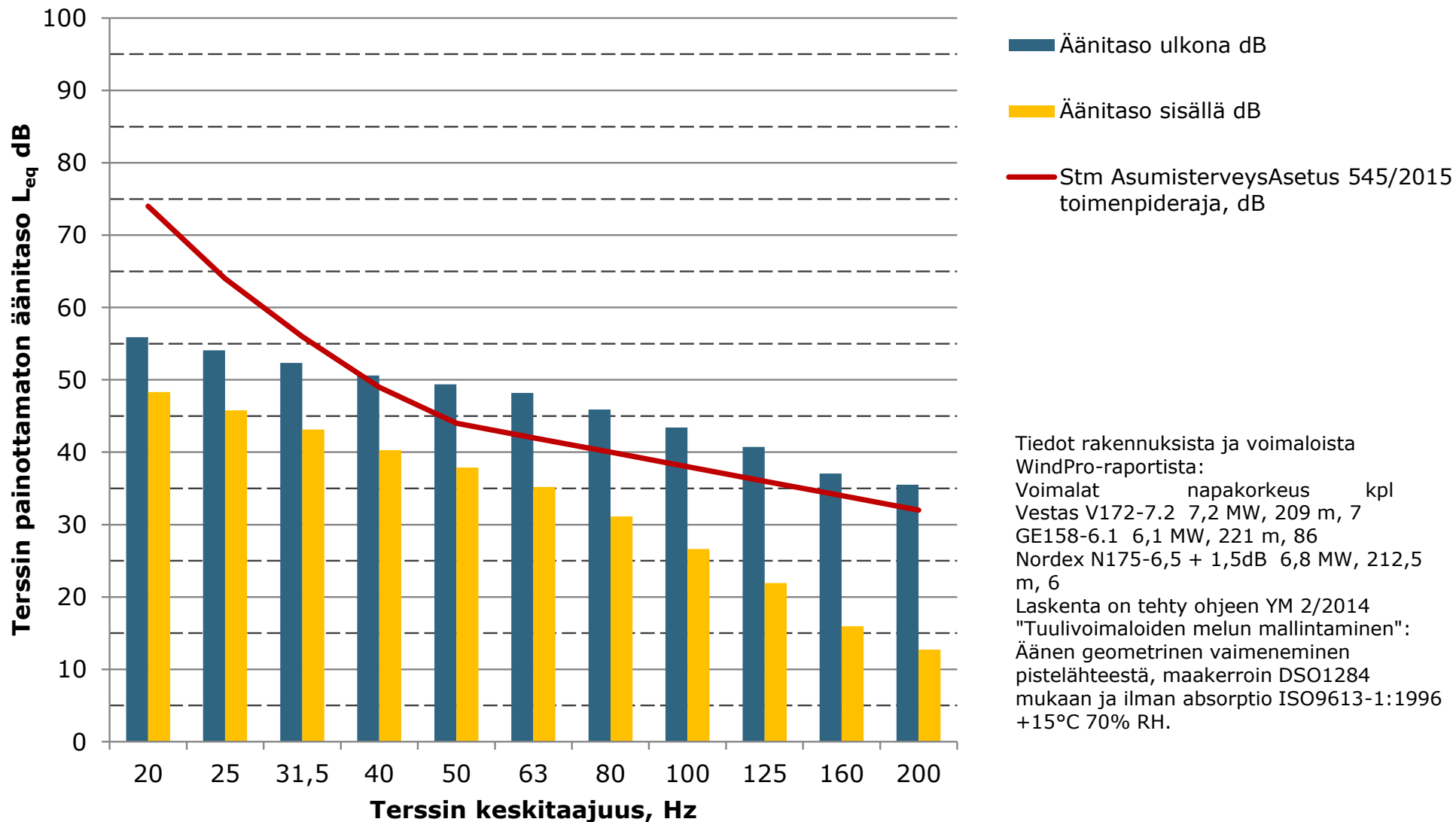
**Matalien taajuuksien äänitasot ulkona ja sisällä, B - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



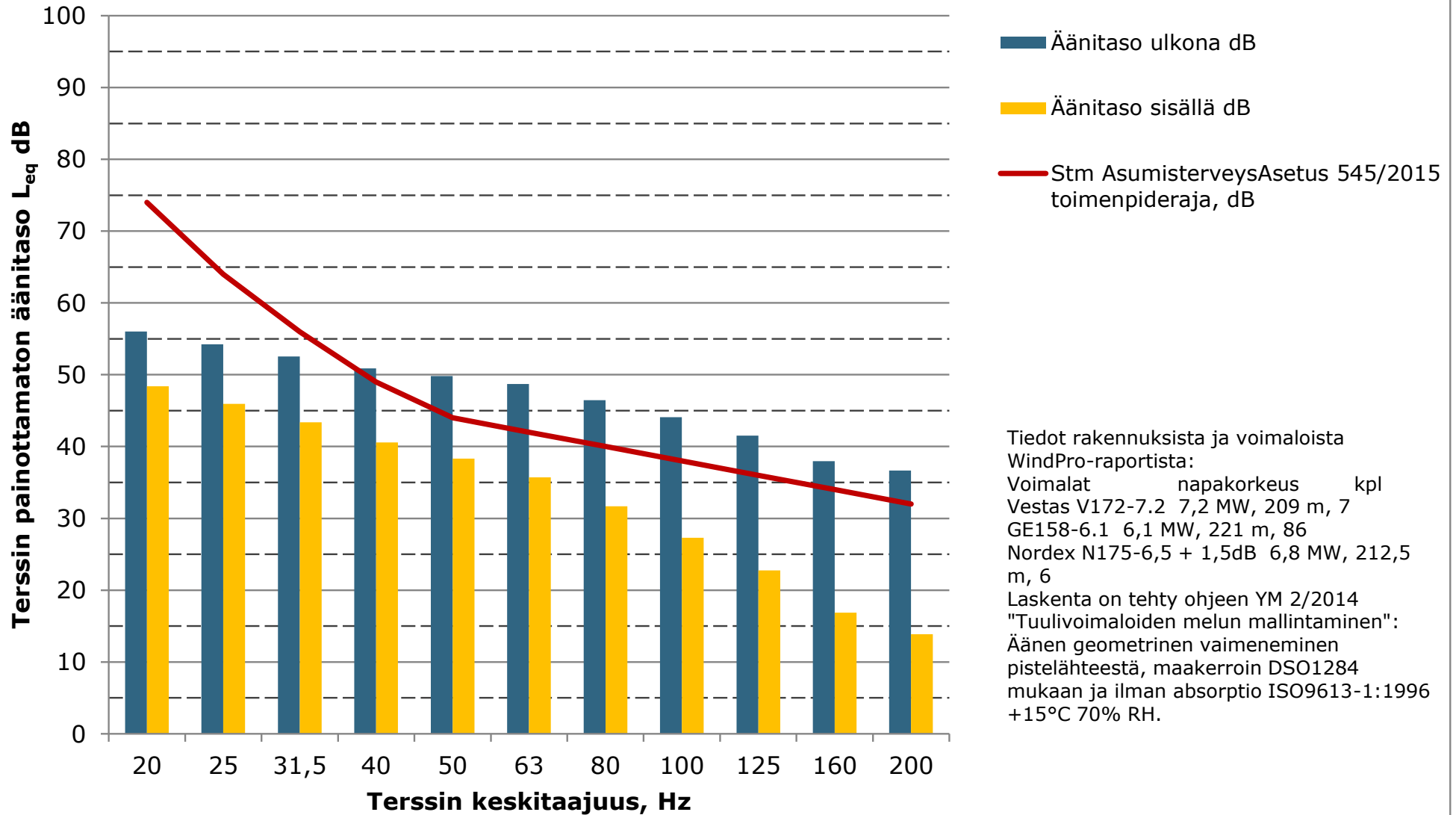
**Matalien taajuuksien äänitasot ulkona ja sisällä, C - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



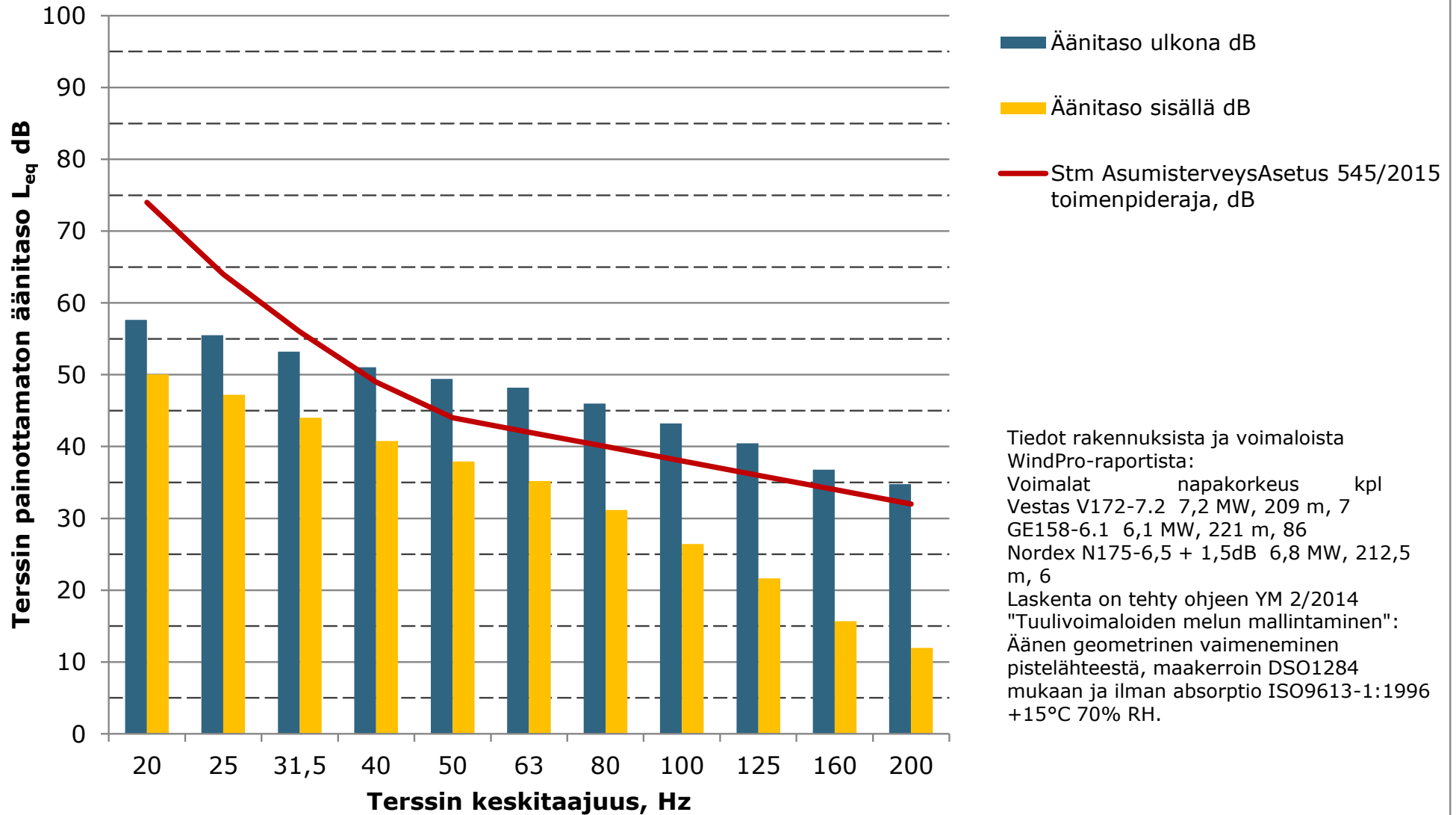
**Matalien taajuuksien äänitasot ulkona ja sisällä, D - Lomarakenus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



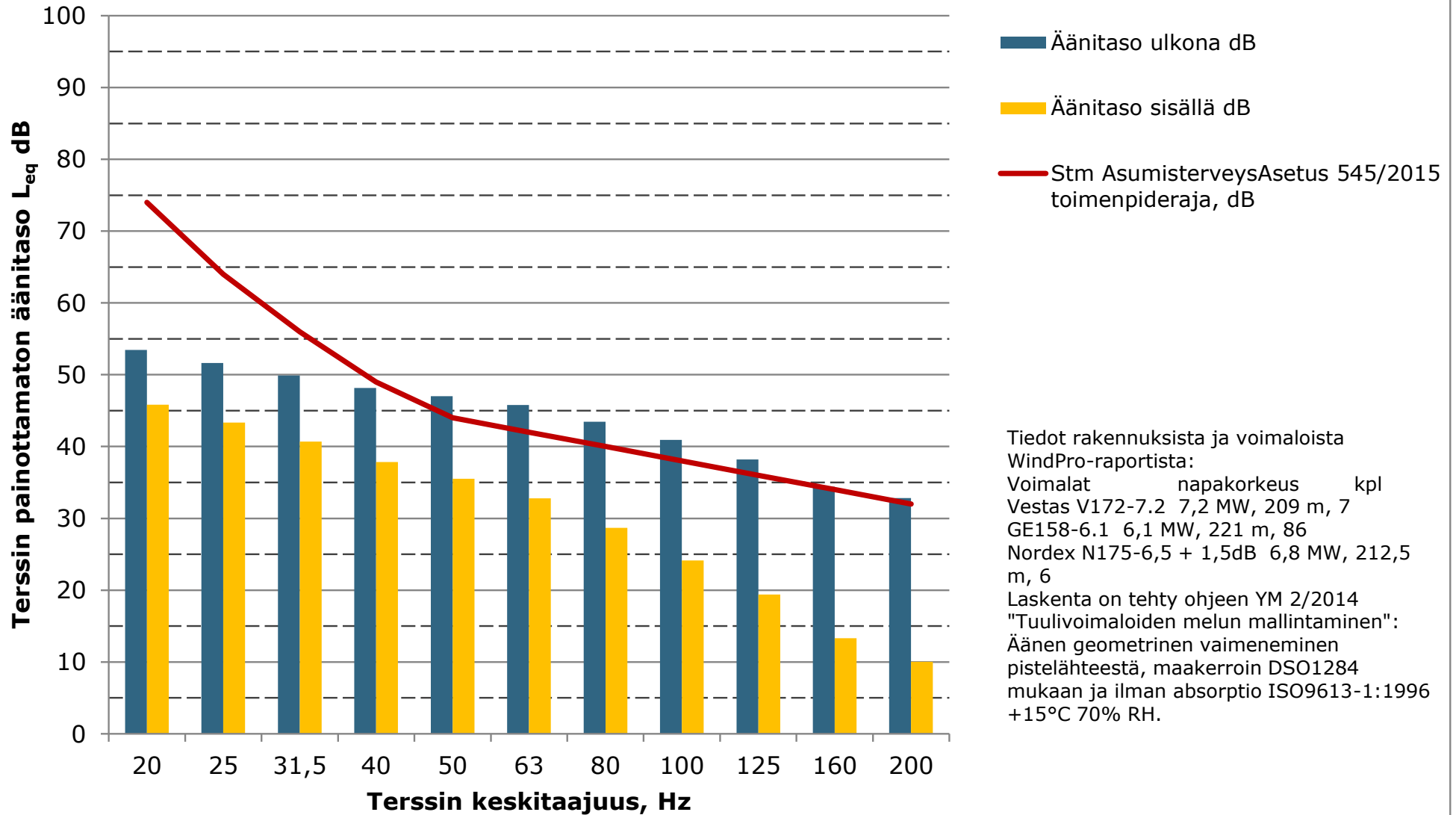
**Matalien taajuuksien äänitasot ulkona ja sisällä, E - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



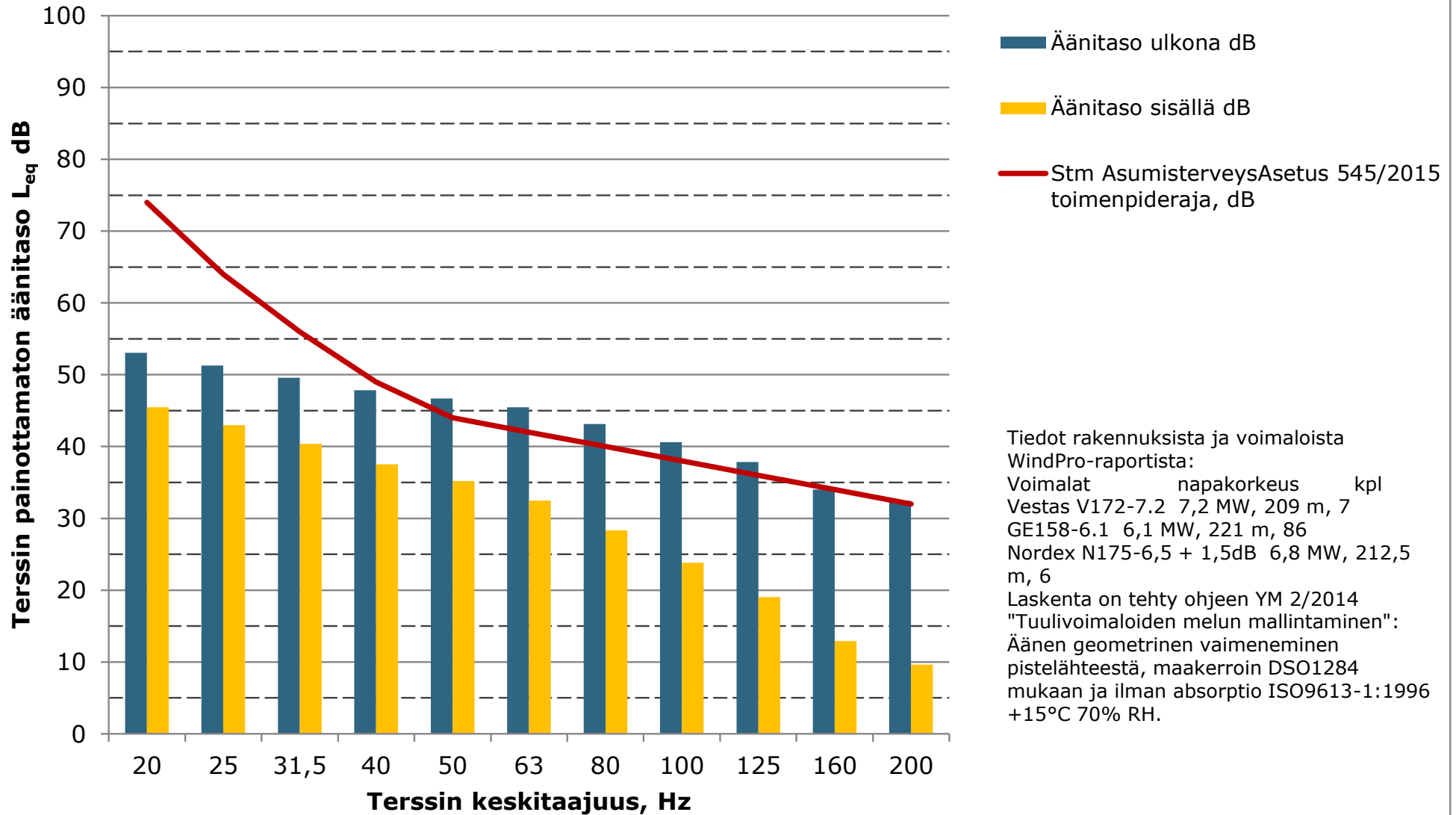
**Matalien taajuuksien äänitasot ulkona ja sisällä, F - Lomarakenus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



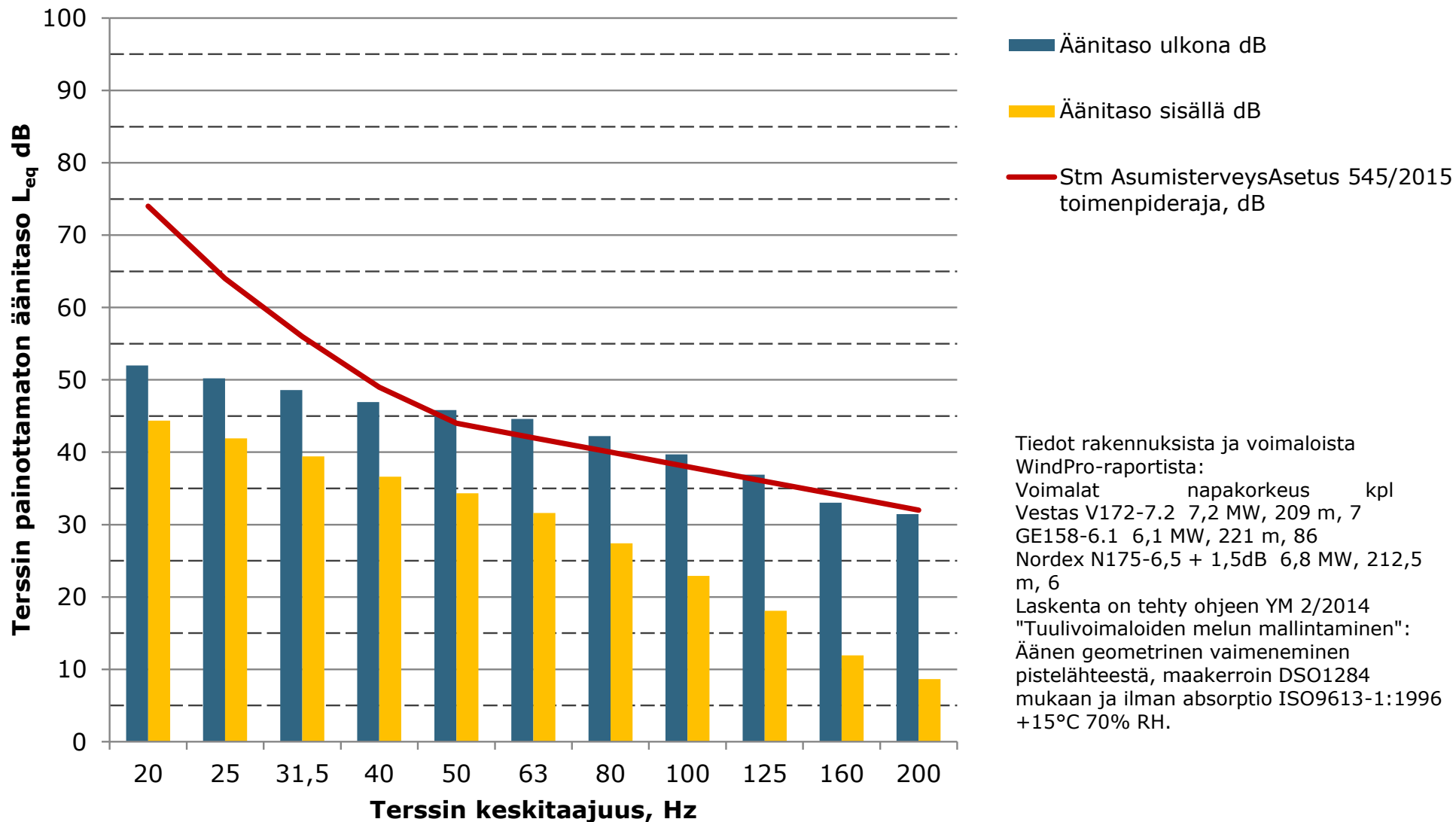
**Matalien taajuuksien äänitasot ulkona ja sisällä, G - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



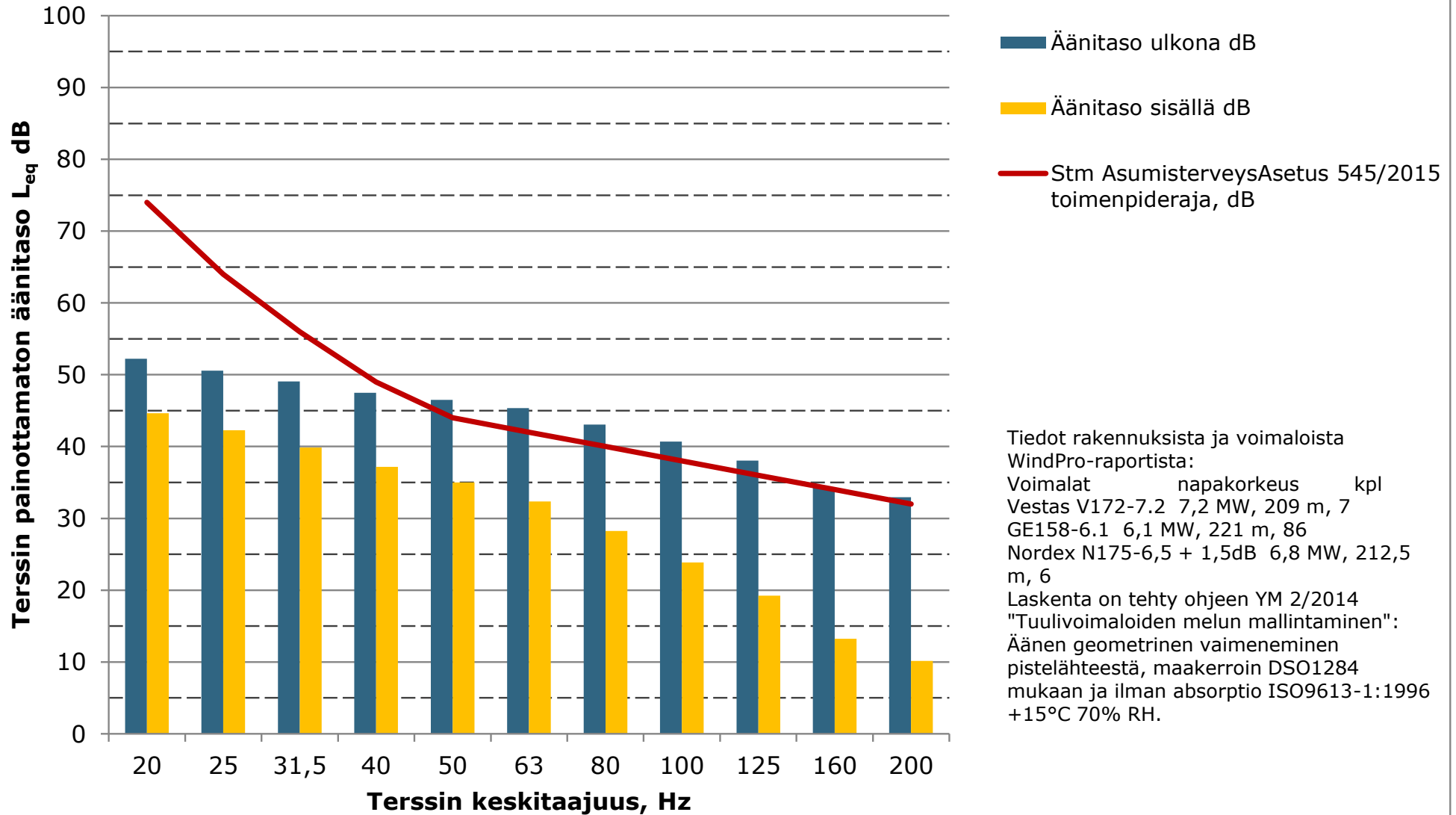
**Matalien taajuuksien äänitasot ulkona ja sisällä, H - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



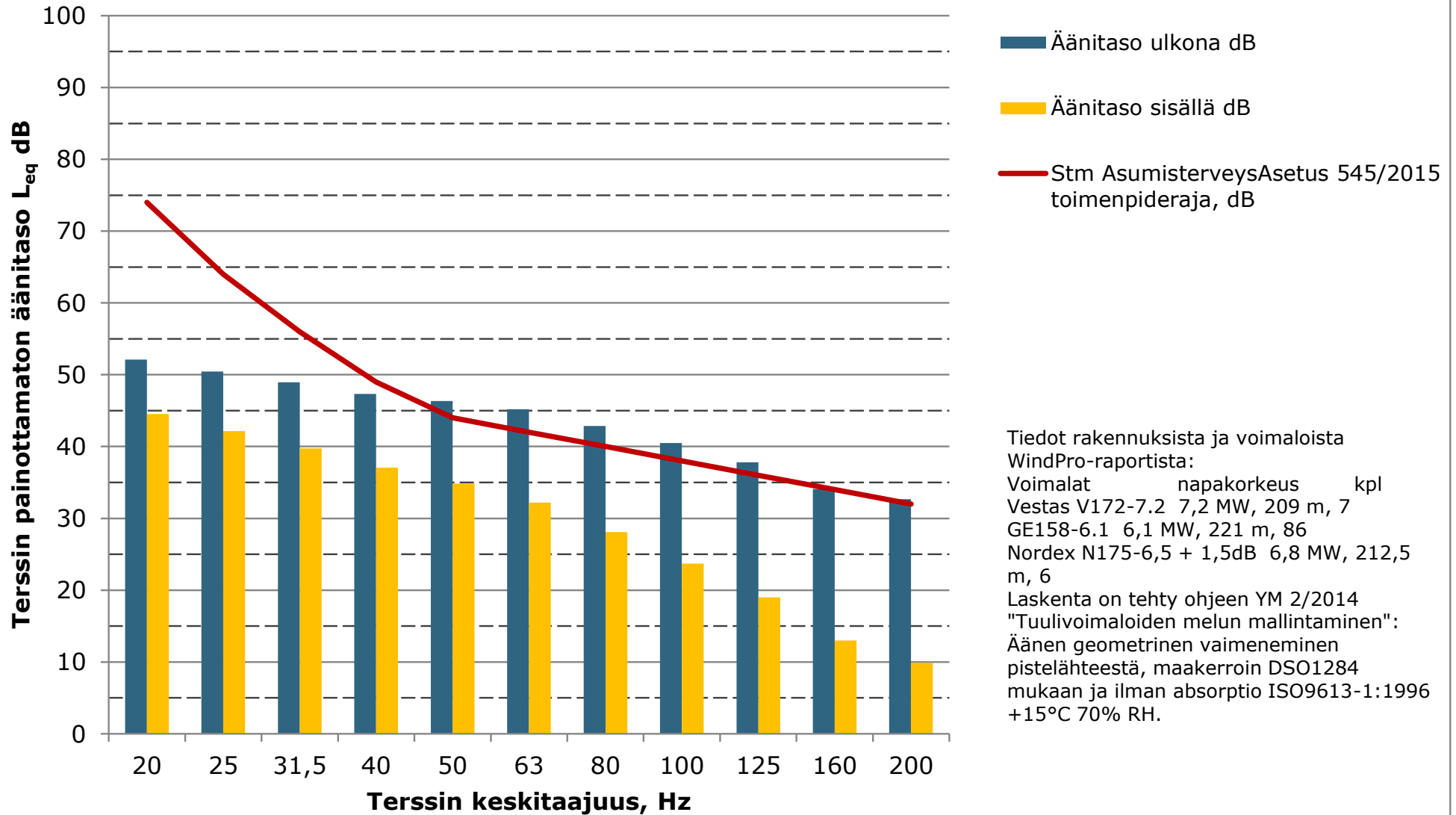
**Matalien taajuuksien äänitasot ulkona ja sisällä, I - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



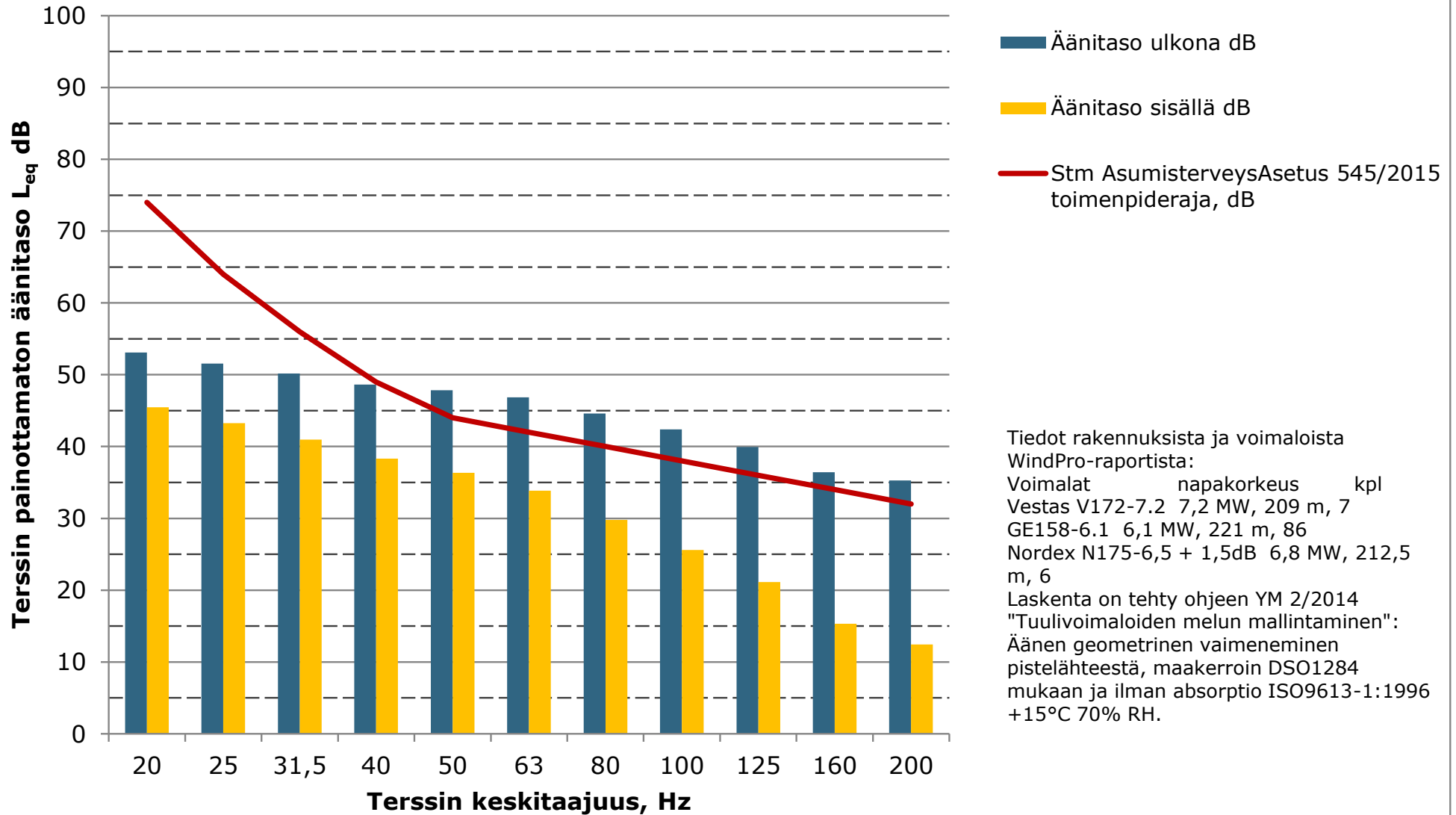
**Matalien taajuuksien äänitasot ulkona ja sisällä, J - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



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



**Matalien taajuuksien äänitasot ulkona ja sisällä, L - Asuinrakennus,
ääneneristävyys Keränen,Hakala,Hongisto 2019, 84% persentiili mukaan**



Bilaga 13. Resultat av modelleringen av sammantagna skuggeffekter "Real Case, No Forest" - Projekteralternativ ALT1

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

29.10.2025 10.05/4.1.273

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

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) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

Operational time

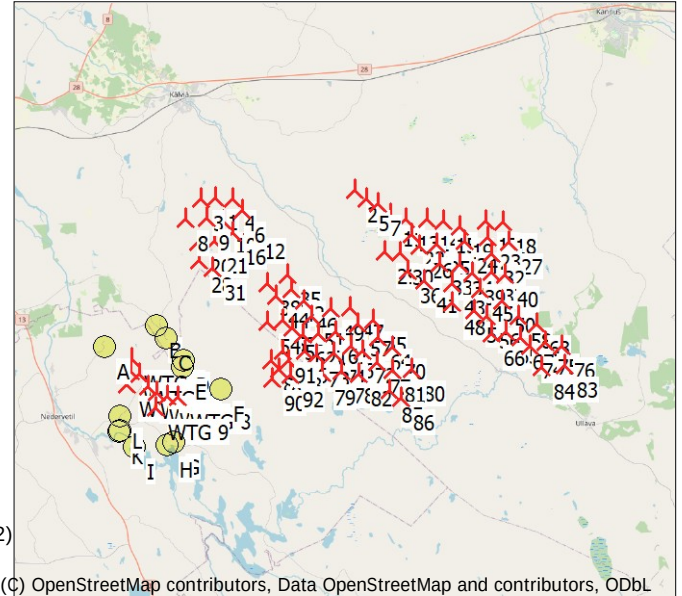
N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
658	501	405	380	500	735	1 005	1 175	840	615	500	540	7 854

Monthly aggregation of real case reduction

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:

DHM: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)

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	327 493	7 080 879	37,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
10	327 857	7 079 670	47,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
11	336 750	7 079 496	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
12	329 315	7 079 265	47,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
13	337 502	7 079 237	62,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
14	338 583	7 079 171	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
15	339 488	7 079 062	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
16	328 261	7 079 000	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
17	341 673	7 078 896	84,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
18	342 656	7 078 786	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
19	340 323	7 078 666	69,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
2	334 916	7 080 924	46,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
20	326 431	7 078 599	47,2	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
21	327 317	7 078 601	54,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
22	337 737	7 078 366	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
23	341 773	7 078 046	78,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
24	340 574	7 077 913	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
25	339 061	7 077 861	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
26	338 100	7 077 748	79,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
27	342 877	7 077 698	84,9	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
28	326 451	7 077 616	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
29	336 295	7 077 559	64,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
3	326 673	7 080 846	35,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
30	337 106	7 077 452	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
31	327 137	7 077 191	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
32	341 960	7 077 158	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
33	339 128	7 076 855	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
34	340 263	7 076 697	74,9	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
35	331 082	7 076 638	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
36	337 438	7 076 482	77,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
37	341 914	7 076 211	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
38	329 973	7 076 196	56,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
39	340 897	7 076 194	87,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
4	328 373	7 080 746	35,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
40	342 574	7 076 008	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4

To be continued on next page...

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

...continued from previous page

	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
			[m]									[RPM]
41	338 290	7 075 921	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
42	331 266	7 075 805	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
43	339 797	7 075 701	77,2	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
44	330 434	7 075 485	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
45	341 273	7 075 296	92,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
46	331 862	7 075 200	44,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
47	334 322	7 074 675	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
48	339 714	7 074 658	74,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
49	333 295	7 074 655	51,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
5	335 479	7 080 381	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
50	342 340	7 074 618	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
51	332 230	7 074 358	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
52	340 852	7 074 260	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
53	330 691	7 074 248	65,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
54	329 892	7 074 163	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
55	335 510	7 073 932	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
56	341 490	7 073 830	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
57	334 674	7 073 827	50,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
58	343 223	7 073 796	91,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
59	331 186	7 073 794	63,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
6	328 915	7 080 121	38,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
60	332 541	7 073 461	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
61	333 495	7 073 434	58,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
62	331 719	7 073 391	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
63	344 123	7 073 332	86,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
64	335 684	7 073 090	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
65	342 490	7 072 981	86,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
66	341 746	7 072 973	95,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
67	343 193	7 072 662	80,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
68	334 273	7 072 646	62,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
69	331 821	7 072 556	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
7	336 091	7 080 107	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
70	336 396	7 072 515	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
71	333 323	7 072 396	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
72	334 880	7 072 358	67,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
73	332 439	7 072 280	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
74	343 750	7 072 210	81,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
75	344 560	7 072 352	85,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
76	345 451	7 072 087	89,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
77	335 593	7 071 697	64,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
78	333 652	7 071 369	65,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
79	332 607	7 071 362	53,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
8	325 833	7 079 822	32,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
80	337 350	7 071 319	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
81	336 385	7 071 244	65,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
82	334 573	7 071 146	70,6	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
83	345 501	7 071 096	97,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
84	344 323	7 070 996	87,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
85	336 165	7 070 220	72,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
86	336 772	7 069 762	72,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
87	329 952	7 072 171	56,8	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
88	330 922	7 072 077	54,6	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
89	330 360	7 071 678	52,6	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
9	326 954	7 079 808	37,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
90	329 950	7 071 136	53,4	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
91	330 569	7 072 574	55,3	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
92	330 940	7 071 318	63,5	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
WTG 1	322 570	7 072 630	39,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 2	322 459	7 071 970	42,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 3	322 968	7 071 771	35,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 4	322 233	7 071 257	44,6	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 5	323 349	7 071 090	40,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 6	323 833	7 070 792	45,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5

To be continued on next page...

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

...continued from previous page

	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
			[m]									[RPM]
WTG 7	324 359	7 070 588	48,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 8	324 934	7 070 443	50,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 9	323 712	7 069 988	49,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5

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	A - Asuinrakennus	321 194	7 073 316	32,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	B - Asuinrakennus	324 024	7 074 328	24,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	C - Asuinrakennus	324 459	7 073 641	29,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	D - Lomarakenus	325 375	7 072 435	30,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	E - Asuinrakennus	325 275	7 072 032	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	F - Lomarakenus	327 197	7 070 758	47,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	G - Asuinrakennus	324 595	7 068 088	51,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	H - Asuinrakennus	324 203	7 067 934	55,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	I - Asuinrakennus	322 423	7 067 969	42,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	J - Asuinrakennus	321 755	7 068 860	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	K - Asuinrakennus	321 664	7 068 837	33,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	L - Asuinrakennus	321 791	7 069 585	50,0	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	A - Asuinrakennus	5:04
B	B - Asuinrakennus	0:00
C	C - Asuinrakennus	0:00
D	D - Lomarakenus	2:19
E	E - Asuinrakennus	8:22
F	F - Lomarakenus	0:00
G	G - Asuinrakennus	0:00
H	H - Asuinrakennus	0:00
I	I - Asuinrakennus	0:00
J	J - Asuinrakennus	0:00
K	K - Asuinrakennus	0:00
L	L - Asuinrakennus	2:01

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

No.	Name	Expected [h/year]
1	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (120)	0:00
10	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (129)	0:00
11	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (130)	0:00
12	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (131)	0:00
13	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (132)	0:00
14	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (133)	0:00
15	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (134)	0:00
16	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (135)	0:00
17	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (136)	0:00
18	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (137)	0:00
19	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (138)	0:00
2	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (121)	0:00
20	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (139)	0:00
21	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (140)	0:00
22	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (141)	0:00
23	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (142)	0:00
24	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (143)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

...continued from previous page

No.	Name	Expected [h/year]
25	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (144)	0:00
26	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (145)	0:00
27	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (146)	0:00
28	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (147)	0:00
29	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (148)	0:00
3	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (122)	0:00
30	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (149)	0:00
31	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (150)	0:00
32	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (151)	0:00
33	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (152)	0:00
34	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (153)	0:00
35	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (154)	0:00
36	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (155)	0:00
37	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (156)	0:00
38	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (157)	0:00
39	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (158)	0:00
4	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (123)	0:00
40	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (159)	0:00
41	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (160)	0:00
42	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (161)	0:00
43	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (162)	0:00
44	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (163)	0:00
45	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (164)	0:00
46	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (165)	0:00
47	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (166)	0:00
48	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (167)	0:00
49	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (168)	0:00
5	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (124)	0:00
50	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (169)	0:00
51	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (170)	0:00
52	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (171)	0:00
53	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (172)	0:00
54	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (173)	0:00
55	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (174)	0:00
56	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (175)	0:00
57	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (176)	0:00
58	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (177)	0:00
59	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (178)	0:00
6	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (125)	0:00
60	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (179)	0:00
61	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (180)	0:00
62	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (181)	0:00
63	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (182)	0:00
64	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (183)	0:00
65	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (184)	0:00
66	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (185)	0:00
67	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (186)	0:00
68	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (187)	0:00
69	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (188)	0:00
7	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (126)	0:00
70	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (189)	0:00
71	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (190)	0:00
72	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (191)	0:00
73	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (192)	0:00
74	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (193)	0:00
75	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (194)	0:00
76	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (195)	0:00
77	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (196)	0:00
78	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (197)	0:00
79	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (198)	0:00
8	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (127)	0:00
80	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (199)	0:00
81	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (200)	0:00
82	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (201)	0:00
83	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (202)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

...continued from previous page

No.	Name	Expected [h/year]
84	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (203)	0:00
85	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (204)	0:00
86	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (205)	0:00
87	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (299)	0:00
88	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (300)	0:00
89	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (301)	0:00
9	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (128)	0:00
90	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (302)	0:00
91	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (303)	0:00
92	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (304)	0:00
WTG 1	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (482)	2:44
WTG 2	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (481)	2:20
WTG 3	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (480)	0:00
WTG 4	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (483)	0:00
WTG 5	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (485)	0:00
WTG 6	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (484)	2:12
WTG 7	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (486)	2:49
WTG 8	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (488)	3:44
WTG 9	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (487)	2:01

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:

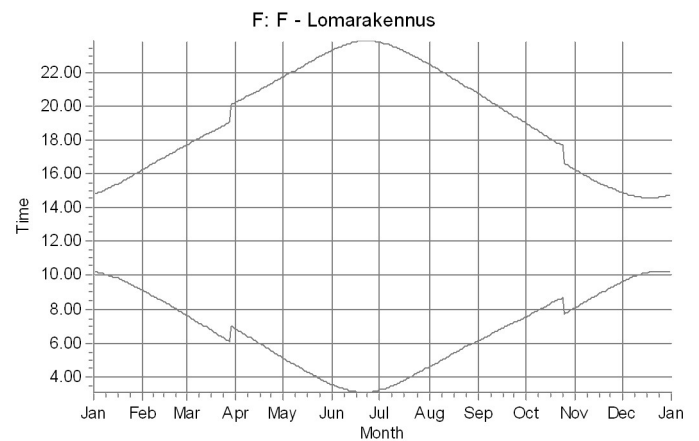
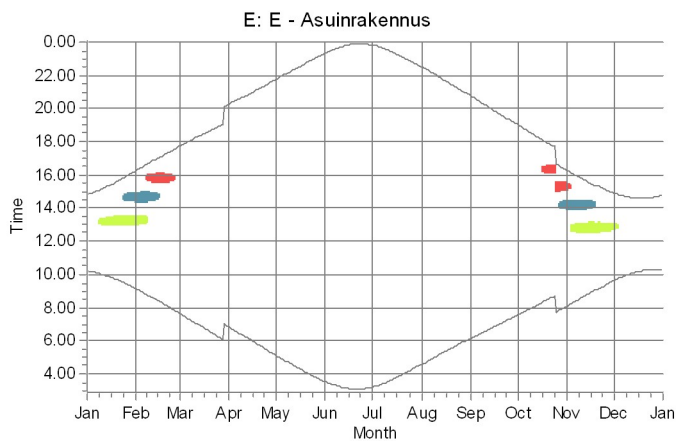
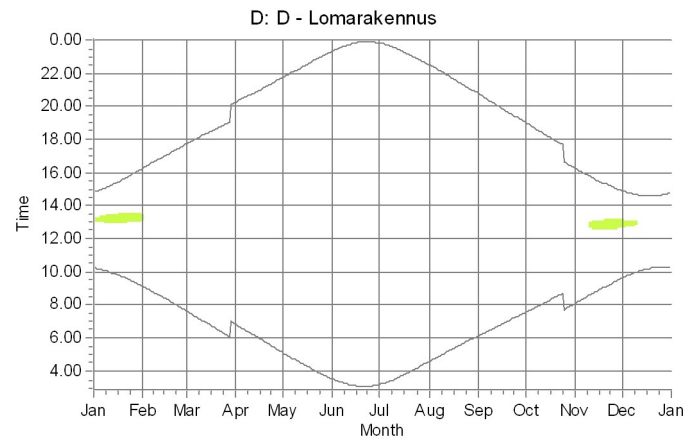
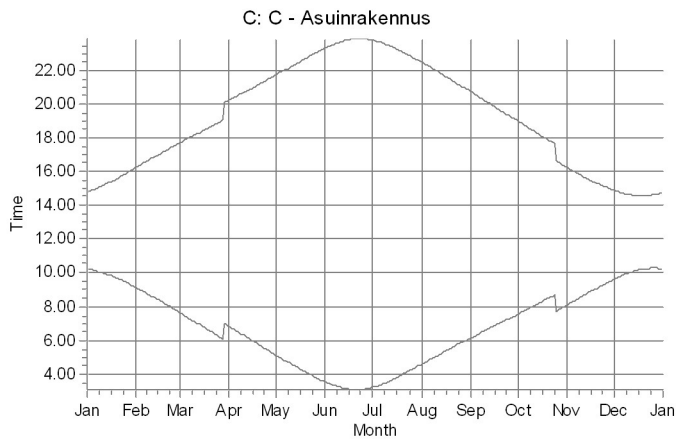
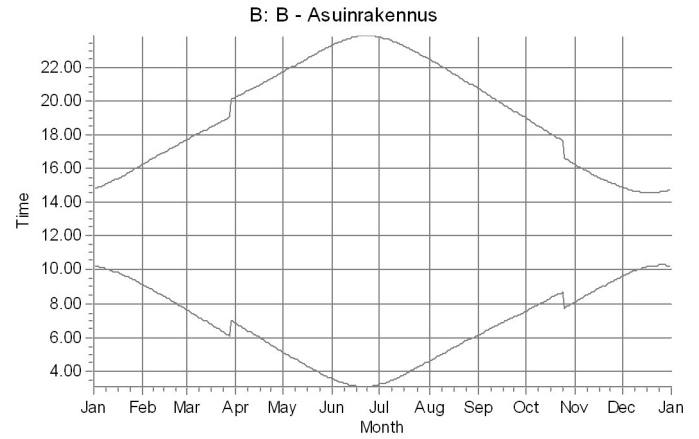
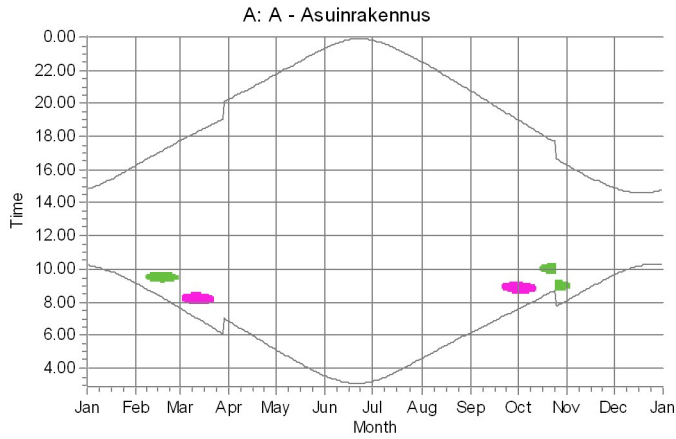
Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henri Korhonen / henri.korhonen@fcg.fi
Calculated:
29.10.2025 10.05/4.1.273

SHADOW - Calendar, graphical

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025



WTG:

WTG 1: Generic RD2000 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (484) WTG 2: Generic RD2000 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (484) WTG 6: Generic RD2000 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (484) WTG 7: Generic RD2000 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (484) WTG 8: Generic RD2000 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (484)

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

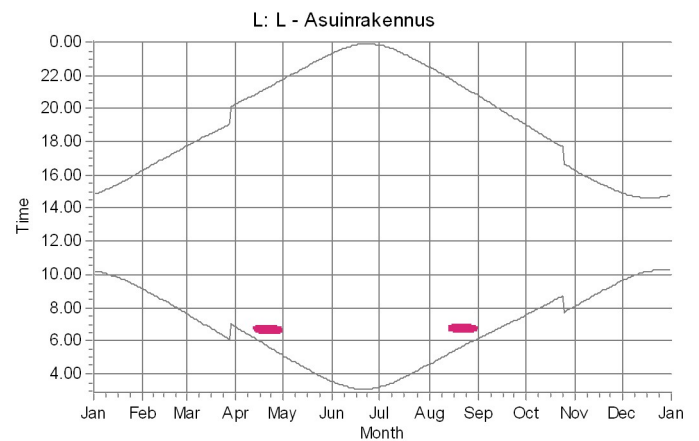
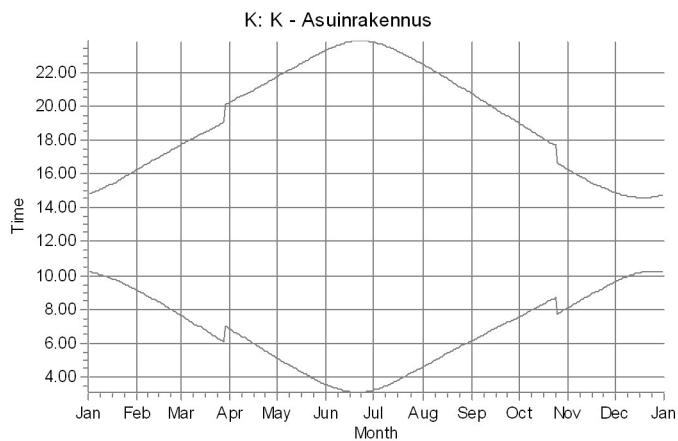
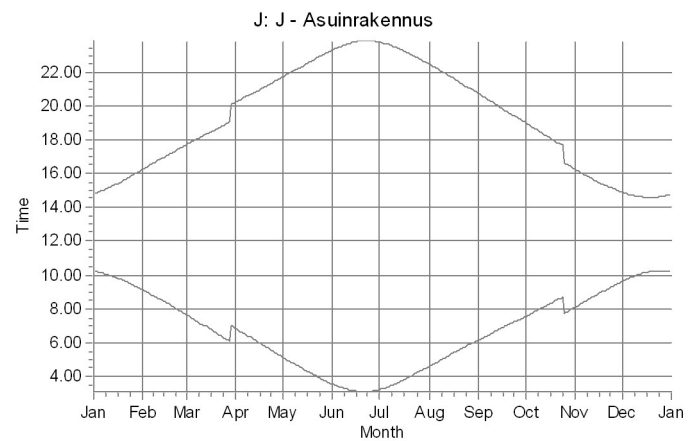
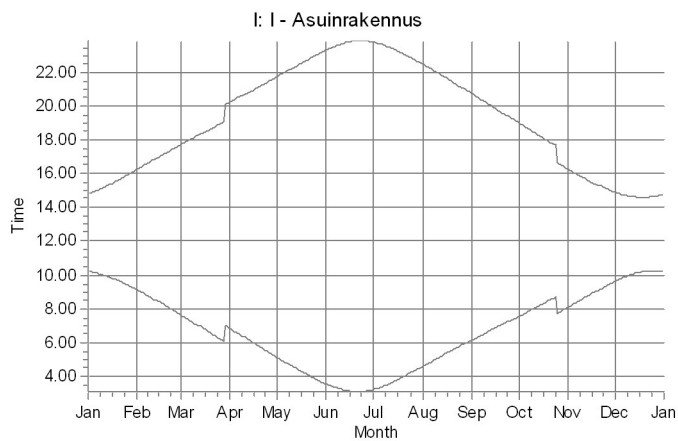
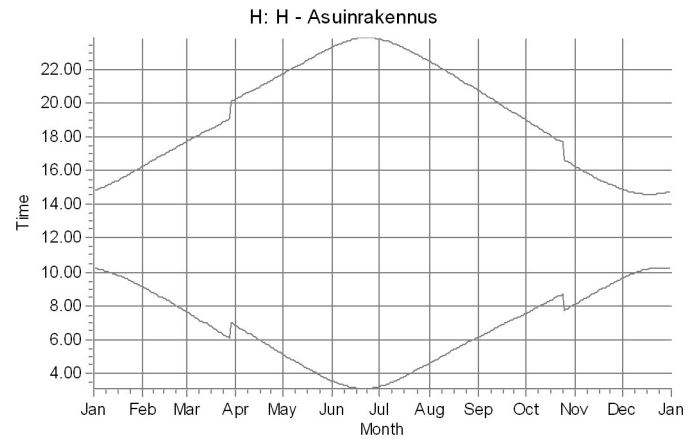
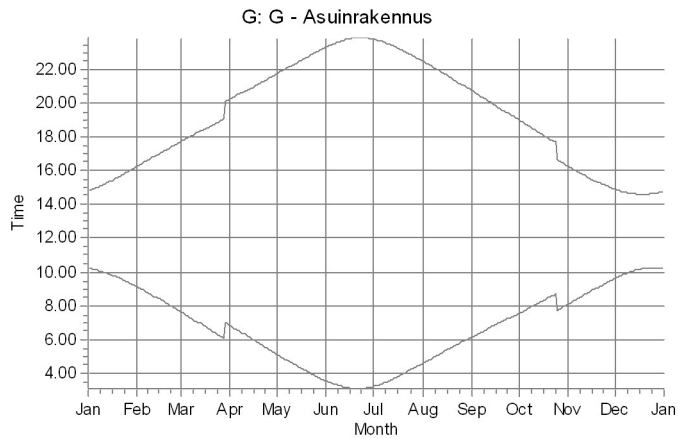
Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

29.10.2025 10.05/4.1.273

SHADOW - Calendar, graphical

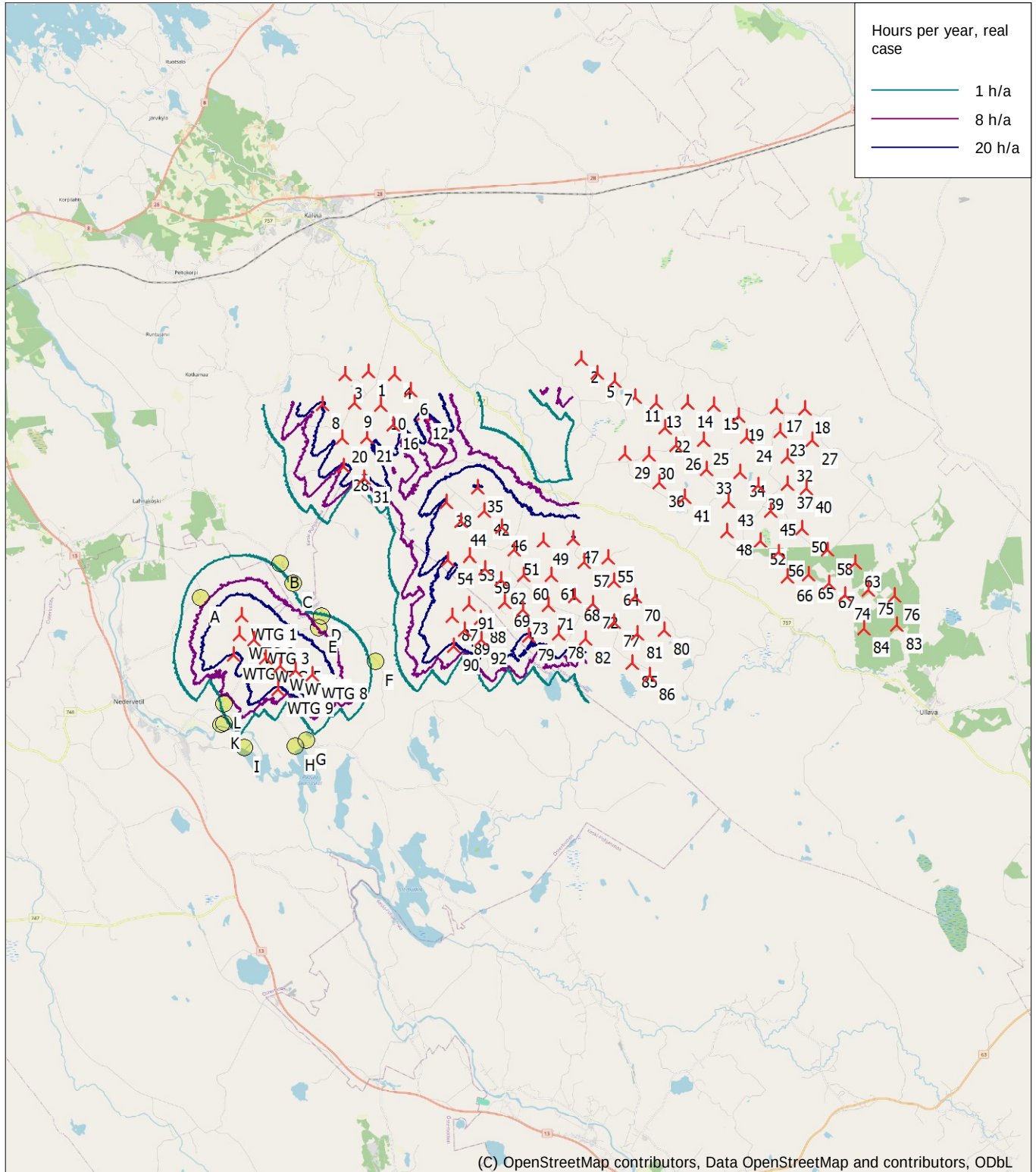
Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025



WTCs
WTC 9: Generic R0200 7200 200.0 H: 195.0 m (TOT: 295.0 m) (487)

SHADOW - Map

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025



Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 331 481 North: 7 072 407
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

**Bilaga 14. Resultat av modelleringen av sammantagna skuggeffekter "Real Case, Luke Forest" -
Projektalternativ ALT1**

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025
 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) [UMEA]

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
 1,02 2,84 3,78 6,14 8,62 9,94 7,42 5,13 4,32 3,43 1,58 0,96

Operational time

N NNE ENE E ESE SSE S SSW WSW W WNW NNW Sum
 658 501 405 380 500 735 1 005 1 175 840 615 500 540 7 854

Monthly aggregation of real case reduction

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:

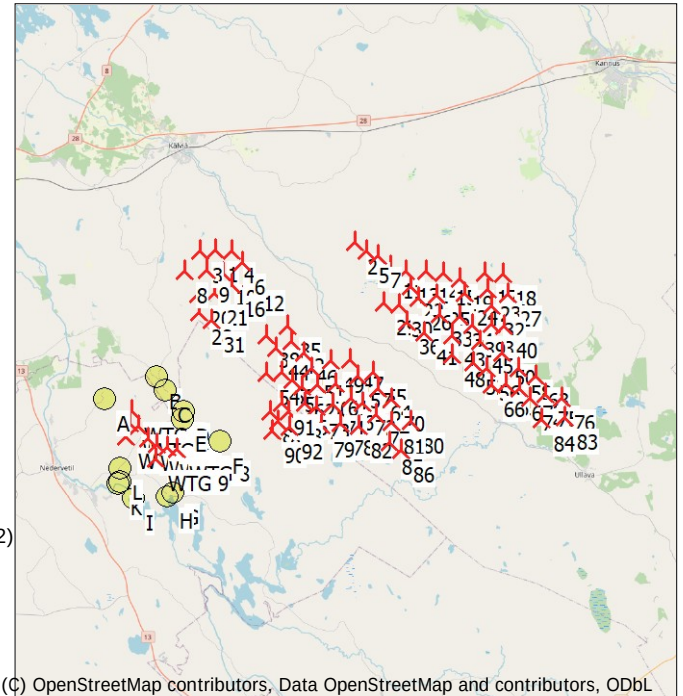
DHM: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)
 Land cover data used in calculation:

Area object(s):

Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI

obstructions): REGIONS_Jolkka_meluvälkemallinnus_jk_0.w2r (5)

Receptor grid resolution: 1,0 m



All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

Scale 1:400 000

▲ New WTG

● Shadow receptor

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
			[m]									[RPM]
1	327 493	7 080 879	37,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
10	327 857	7 079 670	47,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
11	336 750	7 079 496	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
12	329 315	7 079 265	47,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
13	337 502	7 079 237	62,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
14	338 583	7 079 171	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
15	339 488	7 079 062	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
16	328 261	7 079 000	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
17	341 673	7 078 896	84,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
18	342 656	7 078 786	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
19	340 323	7 078 666	69,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
2	334 916	7 080 924	46,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
20	326 431	7 078 599	47,2	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
21	327 317	7 078 601	54,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
22	337 737	7 078 366	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
23	341 773	7 078 046	78,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
24	340 574	7 077 913	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
25	339 061	7 077 861	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
26	338 100	7 077 748	79,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
27	342 877	7 077 698	84,9	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
28	326 451	7 077 616	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
29	336 295	7 077 559	64,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
3	326 673	7 080 846	35,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
30	337 106	7 077 452	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
31	327 137	7 077 191	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
32	341 960	7 077 158	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
33	339 128	7 076 855	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
34	340 263	7 076 697	74,9	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
35	331 082	7 076 638	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
36	337 438	7 076 482	77,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
37	341 914	7 076 211	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4

To be continued on next page...

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025

...continued from previous page

	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
			[m]									[RPM]
38	329 973	7 076 196	56,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
39	340 897	7 076 194	87,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
4	328 373	7 080 746	35,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
40	342 574	7 076 008	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
41	338 290	7 075 921	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
42	331 266	7 075 805	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
43	339 797	7 075 701	77,2	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
44	330 434	7 075 485	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
45	341 273	7 075 296	92,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
46	331 862	7 075 200	44,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
47	334 322	7 074 675	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
48	339 714	7 074 658	74,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
49	333 295	7 074 655	51,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
5	335 479	7 080 381	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
50	342 340	7 074 618	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
51	332 230	7 074 358	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
52	340 852	7 074 260	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
53	330 691	7 074 248	65,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
54	329 892	7 074 163	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
55	335 510	7 073 932	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
56	341 490	7 073 830	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
57	334 674	7 073 827	50,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
58	343 223	7 073 796	91,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
59	331 186	7 073 794	63,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
6	328 915	7 080 121	38,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
60	332 541	7 073 461	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
61	333 495	7 073 434	58,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
62	331 719	7 073 391	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
63	344 123	7 073 332	86,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
64	335 684	7 073 090	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
65	342 490	7 072 981	86,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
66	341 746	7 072 973	95,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
67	343 193	7 072 662	80,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
68	334 273	7 072 646	62,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
69	331 821	7 072 556	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
7	336 091	7 080 107	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
70	336 396	7 072 515	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
71	333 323	7 072 396	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
72	334 880	7 072 358	67,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
73	332 439	7 072 280	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
74	343 750	7 072 210	81,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
75	344 560	7 072 352	85,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
76	345 451	7 072 087	89,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
77	335 593	7 071 697	64,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
78	333 652	7 071 369	65,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
79	332 607	7 071 362	53,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
8	325 833	7 079 822	32,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
80	337 350	7 071 319	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
81	336 385	7 071 244	65,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
82	334 573	7 071 146	70,6	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
83	345 501	7 071 096	97,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
84	344 323	7 070 996	87,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
85	336 165	7 070 220	72,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
86	336 772	7 069 762	72,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
87	329 952	7 072 171	56,8	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
88	330 922	7 072 077	54,6	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
89	330 360	7 071 678	52,6	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
9	326 954	7 079 808	37,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
90	329 950	7 071 136	53,4	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
91	330 569	7 072 574	55,3	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
92	330 940	7 071 318	63,5	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
WTG 1	322 570	7 072 630	39,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 2	322 459	7 071 970	42,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5

To be continued on next page...

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025

...continued from previous page

	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
			[m]									[RPM]
WTG 3	322 968	7 071 771	35,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 4	322 233	7 071 257	44,6	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 5	323 349	7 071 090	40,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 6	323 833	7 070 792	45,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 7	324 359	7 070 588	48,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 8	324 934	7 070 443	50,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 9	323 712	7 069 988	49,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5

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	A - Asuinrakennus	321 194	7 073 316	32,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	B - Asuinrakennus	324 024	7 074 328	24,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	C - Asuinrakennus	324 459	7 073 641	29,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	D - Lomarakenus	325 375	7 072 435	30,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	E - Asuinrakennus	325 275	7 072 032	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	F - Lomarakenus	327 197	7 070 758	47,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	G - Asuinrakennus	324 595	7 068 088	51,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	H - Asuinrakennus	324 203	7 067 934	55,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	I - Asuinrakennus	322 423	7 067 969	42,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	J - Asuinrakennus	321 755	7 068 860	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	K - Asuinrakennus	321 664	7 068 837	33,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	L - Asuinrakennus	321 791	7 069 585	50,0	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	A - Asuinrakennus	5:04
B	B - Asuinrakennus	0:00
C	C - Asuinrakennus	0:00
D	D - Lomarakenus	2:19
E	E - Asuinrakennus	5:02
F	F - Lomarakenus	0:00
G	G - Asuinrakennus	0:00
H	H - Asuinrakennus	0:00
I	I - Asuinrakennus	0:00
J	J - Asuinrakennus	0:00
K	K - Asuinrakennus	0:00
L	L - Asuinrakennus	2:01

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

No.	Name	Expected [h/year]
1	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (120)	0:00
10	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (129)	0:00
11	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (130)	0:00
12	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (131)	0:00
13	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (132)	0:00
14	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (133)	0:00
15	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (134)	0:00
16	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (135)	0:00
17	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (136)	0:00
18	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (137)	0:00
19	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (138)	0:00
2	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (121)	0:00
20	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (139)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025

...continued from previous page

No.	Name	Expected [h/year]
21	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (140)	0:00
22	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (141)	0:00
23	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (142)	0:00
24	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (143)	0:00
25	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (144)	0:00
26	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (145)	0:00
27	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (146)	0:00
28	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (147)	0:00
29	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (148)	0:00
3	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (122)	0:00
30	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (149)	0:00
31	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (150)	0:00
32	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (151)	0:00
33	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (152)	0:00
34	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (153)	0:00
35	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (154)	0:00
36	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (155)	0:00
37	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (156)	0:00
38	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (157)	0:00
39	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (158)	0:00
4	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (123)	0:00
40	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (159)	0:00
41	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (160)	0:00
42	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (161)	0:00
43	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (162)	0:00
44	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (163)	0:00
45	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (164)	0:00
46	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (165)	0:00
47	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (166)	0:00
48	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (167)	0:00
49	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (168)	0:00
5	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (124)	0:00
50	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (169)	0:00
51	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (170)	0:00
52	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (171)	0:00
53	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (172)	0:00
54	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (173)	0:00
55	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (174)	0:00
56	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (175)	0:00
57	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (176)	0:00
58	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (177)	0:00
59	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (178)	0:00
6	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (125)	0:00
60	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (179)	0:00
61	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (180)	0:00
62	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (181)	0:00
63	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (182)	0:00
64	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (183)	0:00
65	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (184)	0:00
66	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (185)	0:00
67	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (186)	0:00
68	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (187)	0:00
69	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (188)	0:00
7	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (126)	0:00
70	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (189)	0:00
71	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (190)	0:00
72	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (191)	0:00
73	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (192)	0:00
74	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (193)	0:00
75	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (194)	0:00
76	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (195)	0:00
77	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (196)	0:00
78	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (197)	0:00
79	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (198)	0:00
8	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (127)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025

...continued from previous page

No.	Name	Expected [h/year]
80	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (199)	0:00
81	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (200)	0:00
82	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (201)	0:00
83	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (202)	0:00
84	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (203)	0:00
85	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (204)	0:00
86	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (205)	0:00
87	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (299)	0:00
88	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (300)	0:00
89	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (301)	0:00
9	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (128)	0:00
90	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (302)	0:00
91	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (303)	0:00
92	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (304)	0:00
WTG 1	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (482)	2:44
WTG 2	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (481)	2:20
WTG 3	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (480)	0:00
WTG 4	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (483)	0:00
WTG 5	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (485)	0:00
WTG 6	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (484)	2:12
WTG 7	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (486)	2:49
WTG 8	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (488)	2:19
WTG 9	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (487)	2:01

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.

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

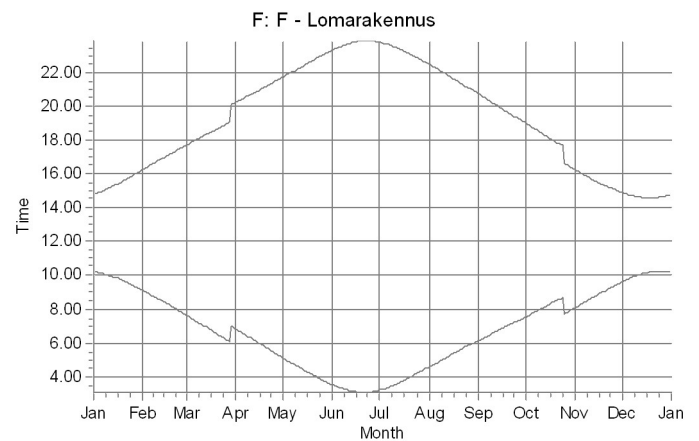
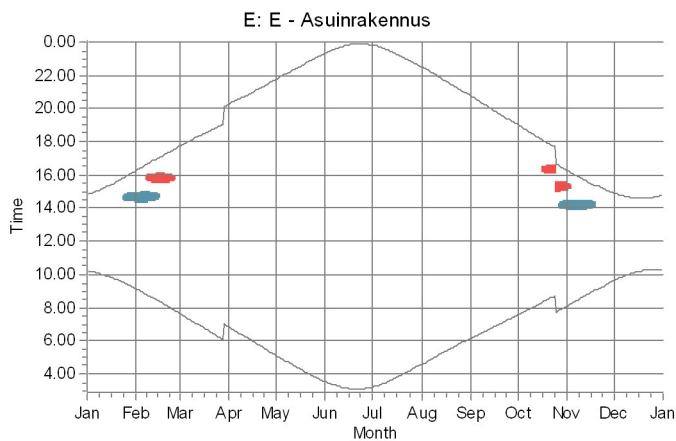
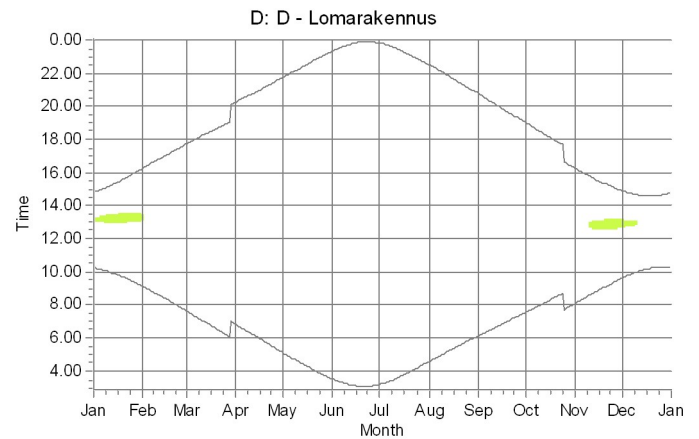
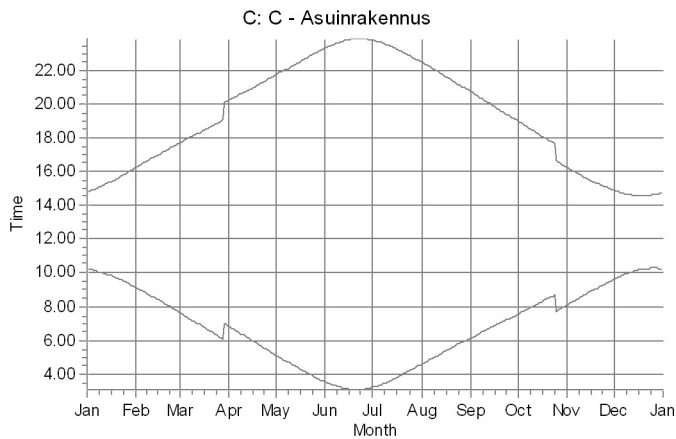
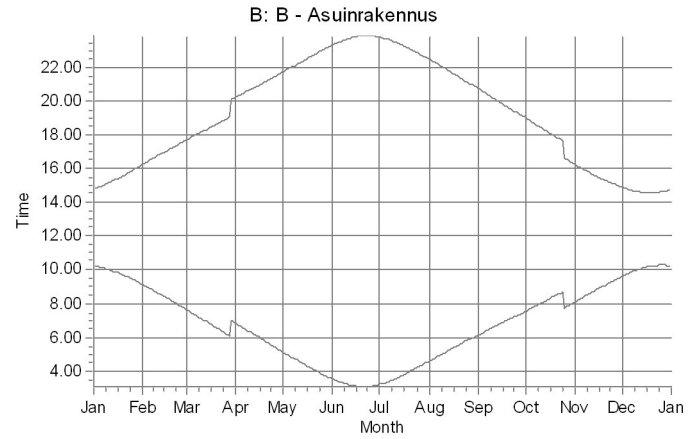
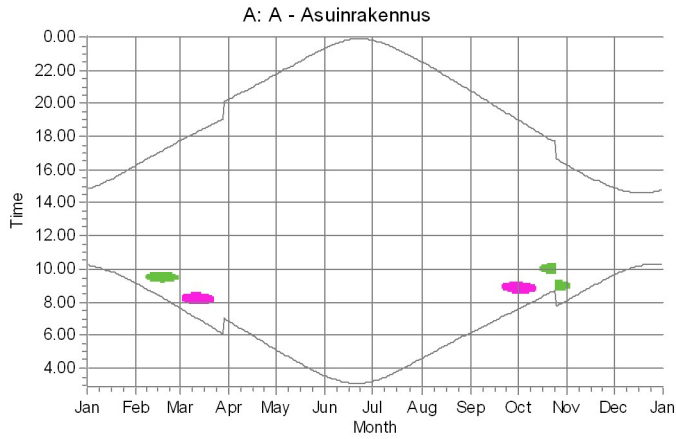
Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

29.10.2025 11.36/4.1.273

SHADOW - Calendar, graphical

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025



WTG:

WTG 1: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (484)

WTG 2: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (484)

WTG 6: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (484)

WTG 7: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (486)

WTG 8: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (486)

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

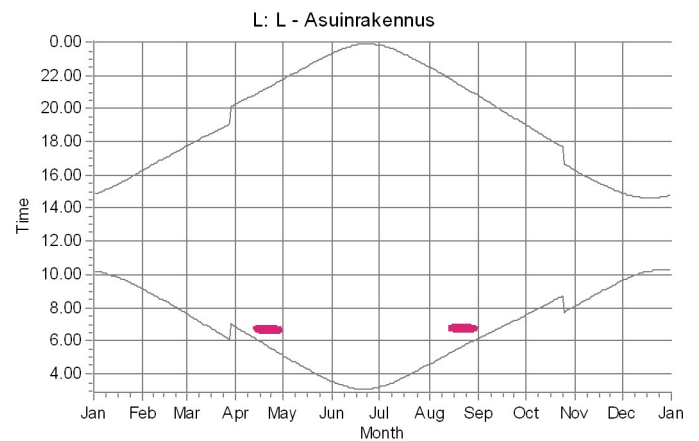
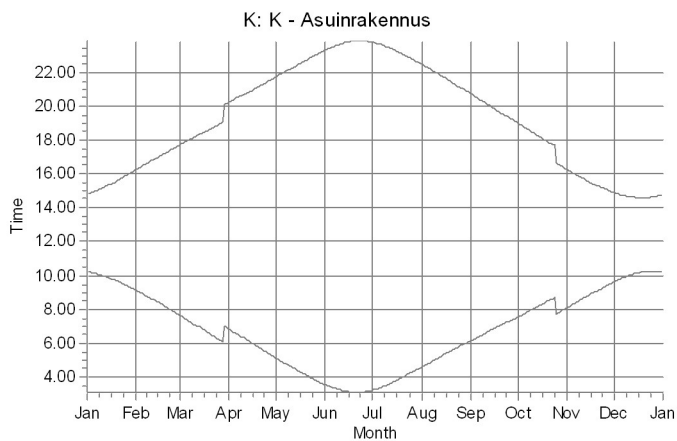
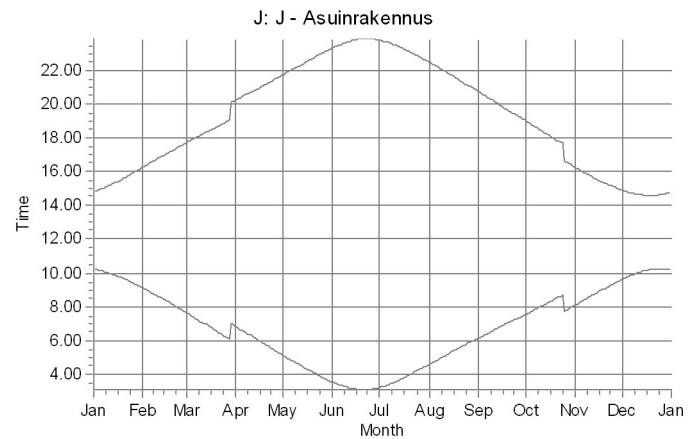
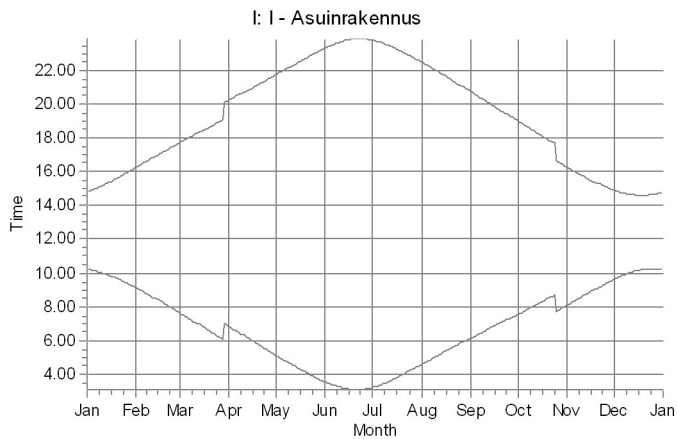
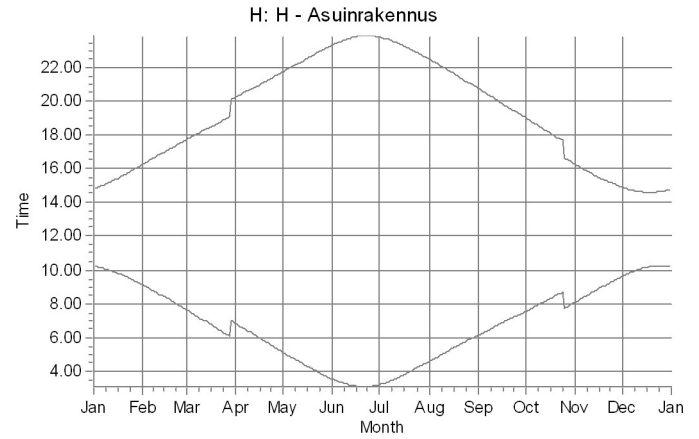
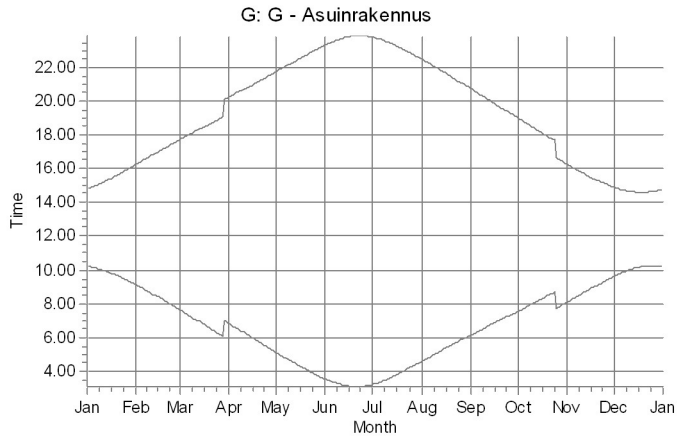
Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

29.10.2025 11.36/4.1.273

SHADOW - Calendar, graphical

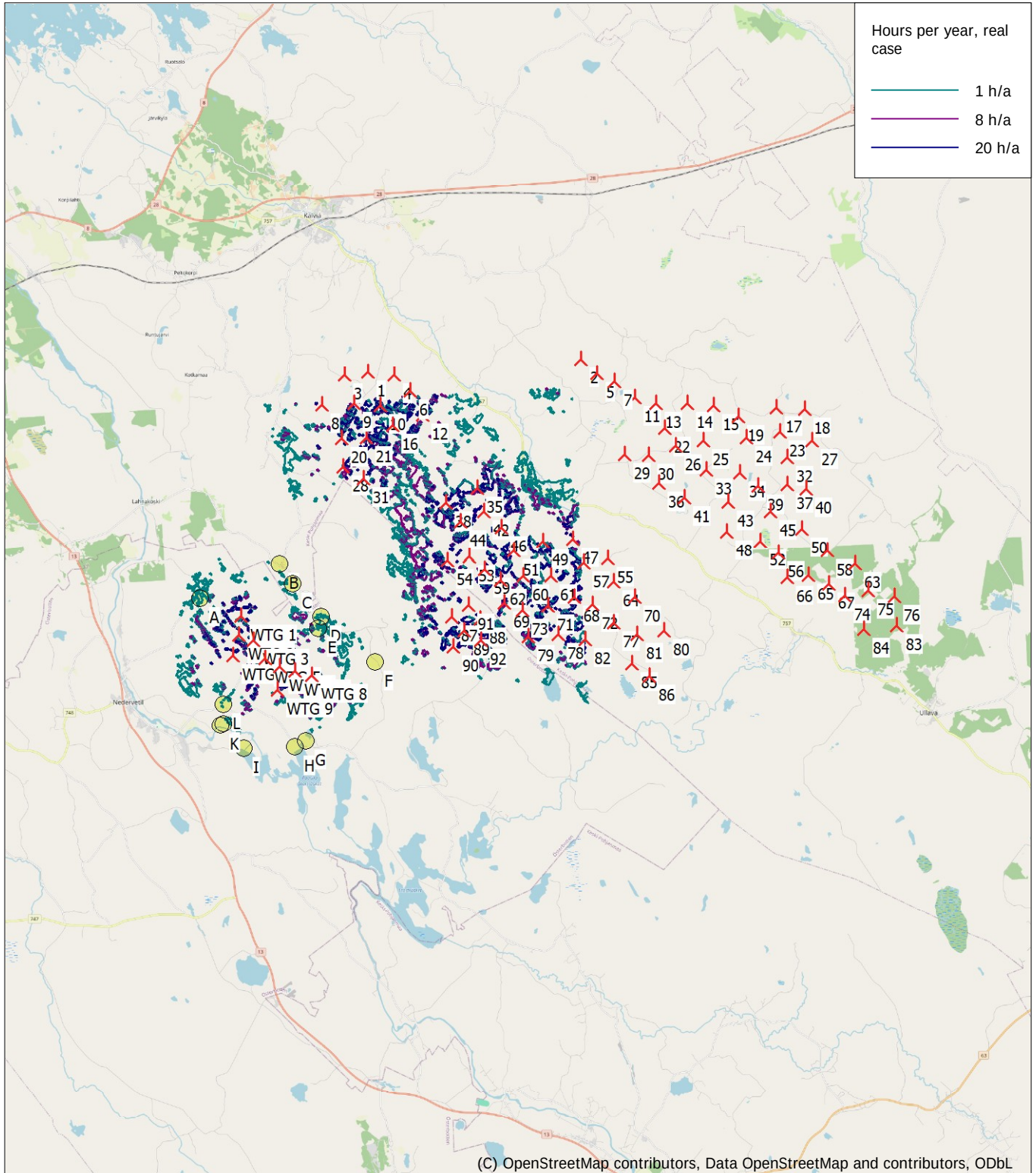
Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025



WTCs
WTC 9: Generic R0200 7200 200.0 H: 195.0 m (TOT: 295.0 m) (487)

SHADOW - Map

Calculation: VE1_Jolkka_RD200x9xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025



Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 331 481 North: 7 072 407
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

Bilaga 15. Resultat av modelleringen av sammantagna skuggeffekter "Real Case, No Forest" - Projekteralternativ ALT2

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

29.10.2025 10.13/4.1.273

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

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) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

Operational time

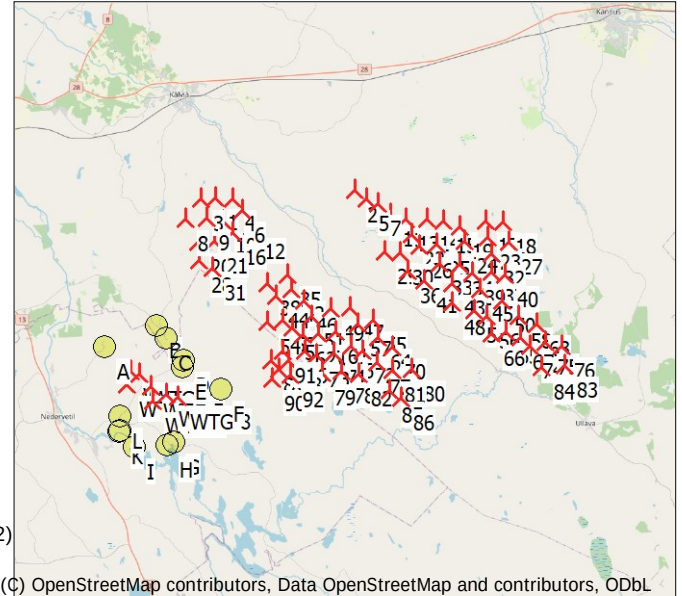
N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
658	501	405	380	500	735	1 005	1 175	840	615	500	540	7 854

Monthly aggregation of real case reduction

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:

DHM: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)

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	327 493	7 080 879	37,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
10	327 857	7 079 670	47,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
11	336 750	7 079 496	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
12	329 315	7 079 265	47,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
13	337 502	7 079 237	62,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
14	338 583	7 079 171	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
15	339 488	7 079 062	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
16	328 261	7 079 000	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
17	341 673	7 078 896	84,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
18	342 656	7 078 786	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
19	340 323	7 078 666	69,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
2	334 916	7 080 924	46,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
20	326 431	7 078 599	47,2	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
21	327 317	7 078 601	54,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
22	337 737	7 078 366	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
23	341 773	7 078 046	78,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
24	340 574	7 077 913	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
25	339 061	7 077 861	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
26	338 100	7 077 748	79,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
27	342 877	7 077 698	84,9	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
28	326 451	7 077 616	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
29	336 295	7 077 559	64,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
3	326 673	7 080 846	35,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
30	337 106	7 077 452	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
31	327 137	7 077 191	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
32	341 960	7 077 158	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
33	339 128	7 076 855	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
34	340 263	7 076 697	74,9	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
35	331 082	7 076 638	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
36	337 438	7 076 482	77,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
37	341 914	7 076 211	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
38	329 973	7 076 196	56,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
39	340 897	7 076 194	87,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
4	328 373	7 080 746	35,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
40	342 574	7 076 008	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4

To be continued on next page...

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

29.10.2025 10.13/4.1.273

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

...continued from previous page

	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
			[m]									[RPM]
41	338 290	7 075 921	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
42	331 266	7 075 805	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
43	339 797	7 075 701	77,2	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
44	330 434	7 075 485	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
45	341 273	7 075 296	92,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
46	331 862	7 075 200	44,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
47	334 322	7 074 675	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
48	339 714	7 074 658	74,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
49	333 295	7 074 655	51,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
5	335 479	7 080 381	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
50	342 340	7 074 618	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
51	332 230	7 074 358	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
52	340 852	7 074 260	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
53	330 691	7 074 248	65,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
54	329 892	7 074 163	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
55	335 510	7 073 932	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
56	341 490	7 073 830	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
57	334 674	7 073 827	50,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
58	343 223	7 073 796	91,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
59	331 186	7 073 794	63,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
6	328 915	7 080 121	38,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
60	332 541	7 073 461	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
61	333 495	7 073 434	58,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
62	331 719	7 073 391	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
63	344 123	7 073 332	86,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
64	335 684	7 073 090	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
65	342 490	7 072 981	86,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
66	341 746	7 072 973	95,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
67	343 193	7 072 662	80,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
68	334 273	7 072 646	62,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
69	331 821	7 072 556	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
7	336 091	7 080 107	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
70	336 396	7 072 515	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
71	333 323	7 072 396	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
72	334 880	7 072 358	67,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
73	332 439	7 072 280	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
74	343 750	7 072 210	81,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
75	344 560	7 072 352	85,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
76	345 451	7 072 087	89,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
77	335 593	7 071 697	64,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
78	333 652	7 071 369	65,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
79	332 607	7 071 362	53,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
8	325 833	7 079 822	32,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
80	337 350	7 071 319	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
81	336 385	7 071 244	65,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
82	334 573	7 071 146	70,6	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
83	345 501	7 071 096	97,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
84	344 323	7 070 996	87,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
85	336 165	7 070 220	72,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
86	336 772	7 069 762	72,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
87	329 952	7 072 171	56,8	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
88	330 922	7 072 077	54,6	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
89	330 360	7 071 678	52,6	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
9	326 954	7 079 808	37,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
90	329 950	7 071 136	53,4	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
91	330 569	7 072 574	55,3	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
92	330 940	7 071 318	63,5	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
WTG 2	322 459	7 071 970	42,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 3	322 968	7 071 771	35,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 4	322 233	7 071 257	44,6	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 5	323 504	7 071 059	45,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 6	323 609	7 070 303	45,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 7	324 270	7 070 629	45,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 8	324 869	7 070 455	48,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

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	A - Asuinrakennus	321 194	7 073 316	32,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B	B - Asuinrakennus	324 024	7 074 328	24,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C	C - Asuinrakennus	324 459	7 073 641	29,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D	D - Lomarakenus	325 375	7 072 435	30,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E	E - Asuinrakennus	325 275	7 072 032	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F	F - Lomarakenus	327 197	7 070 758	47,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G	G - Asuinrakennus	324 595	7 068 088	51,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H	H - Asuinrakennus	324 203	7 067 934	55,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I	I - Asuinrakennus	322 423	7 067 969	42,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J	J - Asuinrakennus	321 755	7 068 860	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K	K - Asuinrakennus	321 664	7 068 837	33,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L	L - Asuinrakennus	321 791	7 069 585	50,0	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	A - Asuinrakennus	2:20
B	B - Asuinrakennus	0:00
C	C - Asuinrakennus	0:00
D	D - Lomarakenus	2:17
E	E - Asuinrakennus	7:51
F	F - Lomarakenus	0:00
G	G - Asuinrakennus	0:00
H	H - Asuinrakennus	0:00
I	I - Asuinrakennus	0:00
J	J - Asuinrakennus	0:00
K	K - Asuinrakennus	0:00
L	L - Asuinrakennus	2:44

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

No.	Name	Expected [h/year]
1	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (120)	0:00
10	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (129)	0:00
11	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (130)	0:00
12	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (131)	0:00
13	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (132)	0:00
14	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (133)	0:00
15	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (134)	0:00
16	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (135)	0:00
17	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (136)	0:00
18	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (137)	0:00
19	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (138)	0:00
2	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (121)	0:00
20	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (139)	0:00
21	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (140)	0:00
22	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (141)	0:00
23	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (142)	0:00
24	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (143)	0:00
25	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (144)	0:00
26	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (145)	0:00
27	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (146)	0:00
28	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (147)	0:00
29	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (148)	0:00
3	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (122)	0:00
30	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (149)	0:00
31	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (150)	0:00
32	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (151)	0:00
33	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (152)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

...continued from previous page

No.	Name	Expected [h/year]
34	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (153)	0:00
35	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (154)	0:00
36	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (155)	0:00
37	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (156)	0:00
38	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (157)	0:00
39	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (158)	0:00
4	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (123)	0:00
40	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (159)	0:00
41	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (160)	0:00
42	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (161)	0:00
43	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (162)	0:00
44	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (163)	0:00
45	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (164)	0:00
46	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (165)	0:00
47	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (166)	0:00
48	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (167)	0:00
49	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (168)	0:00
5	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (124)	0:00
50	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (169)	0:00
51	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (170)	0:00
52	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (171)	0:00
53	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (172)	0:00
54	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (173)	0:00
55	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (174)	0:00
56	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (175)	0:00
57	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (176)	0:00
58	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (177)	0:00
59	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (178)	0:00
6	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (125)	0:00
60	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (179)	0:00
61	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (180)	0:00
62	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (181)	0:00
63	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (182)	0:00
64	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (183)	0:00
65	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (184)	0:00
66	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (185)	0:00
67	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (186)	0:00
68	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (187)	0:00
69	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (188)	0:00
7	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (126)	0:00
70	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (189)	0:00
71	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (190)	0:00
72	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (191)	0:00
73	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (192)	0:00
74	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (193)	0:00
75	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (194)	0:00
76	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (195)	0:00
77	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (196)	0:00
78	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (197)	0:00
79	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (198)	0:00
8	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (127)	0:00
80	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (199)	0:00
81	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (200)	0:00
82	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (201)	0:00
83	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (202)	0:00
84	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (203)	0:00
85	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (204)	0:00
86	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (205)	0:00
87	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (299)	0:00
88	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (300)	0:00
89	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (301)	0:00
9	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (128)	0:00
90	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (302)	0:00
91	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (303)	0:00
92	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (304)	0:00

To be continued on next page...

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy
Osmontie 34, PO Box 950
FI-00601 Helsinki
+358104095666
Henri Korhonen / henri.korhonen@fcg.fi
Calculated:
29.10.2025 10.13/4.1.273

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

...continued from previous page

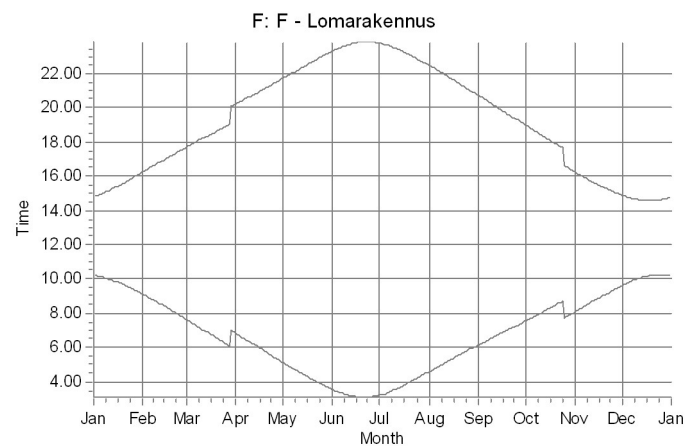
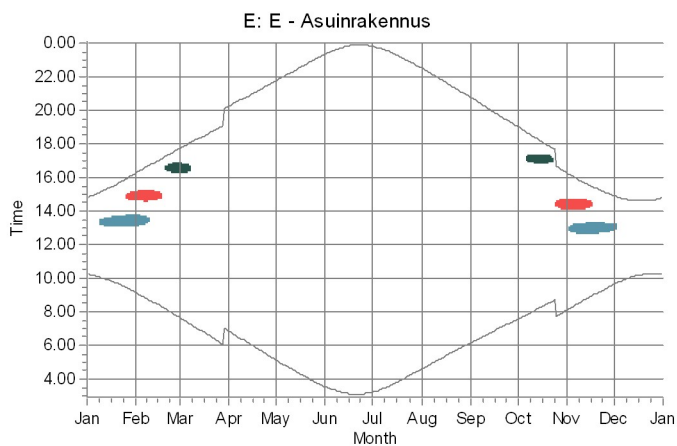
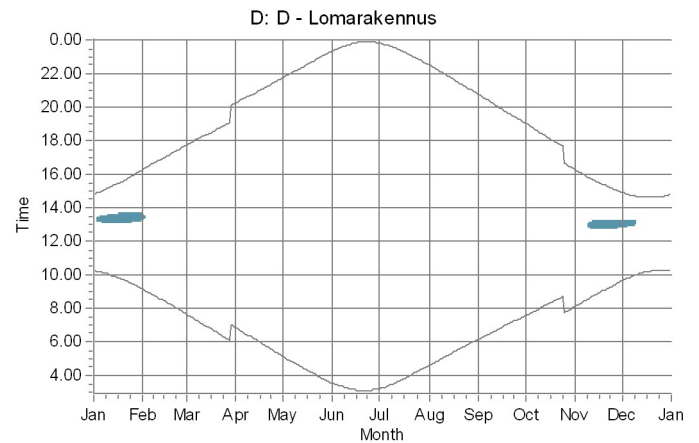
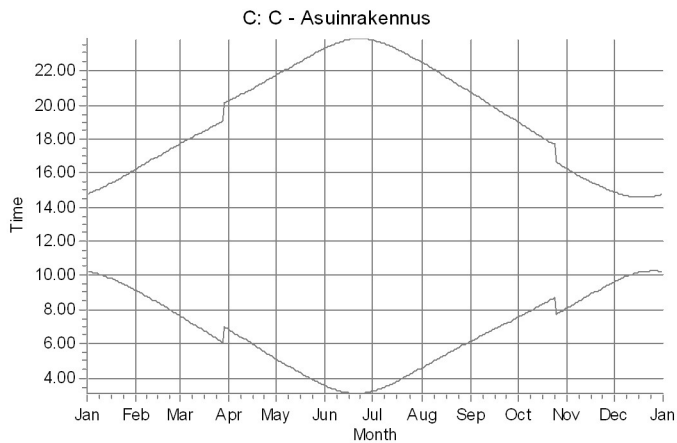
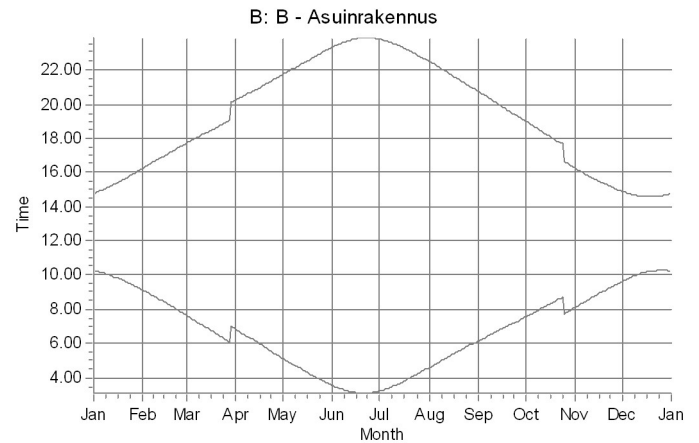
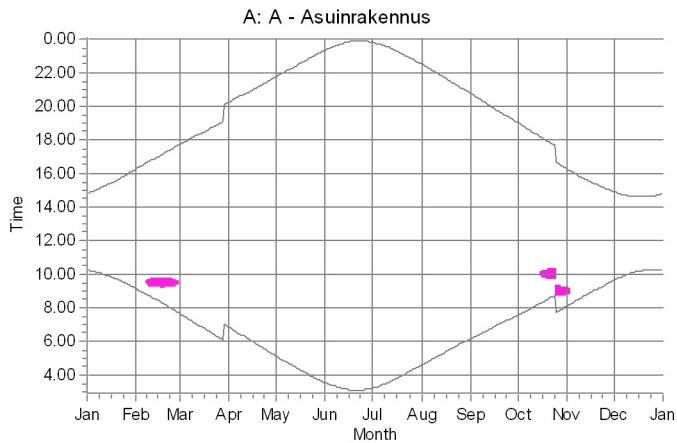
No.	Name	Expected [h/year]
WTG 2	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (490)	2:20
WTG 3	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (489)	0:00
WTG 4	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (491)	0:00
WTG 5	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (493)	1:47
WTG 6	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (492)	2:44
WTG 7	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (494)	2:47
WTG 8	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (495)	3:39

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: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025



WTG:

WTG 2: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (490)

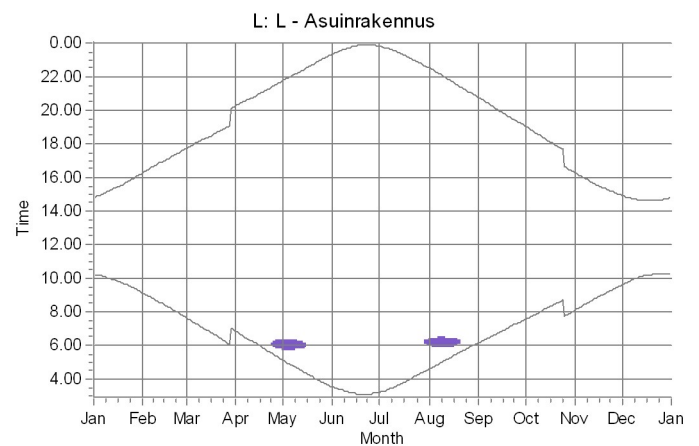
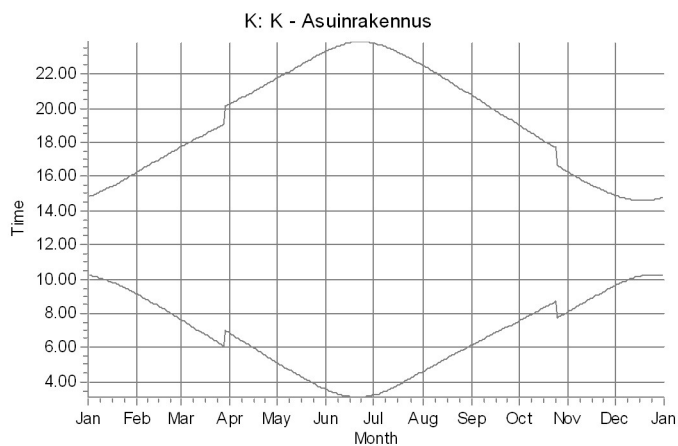
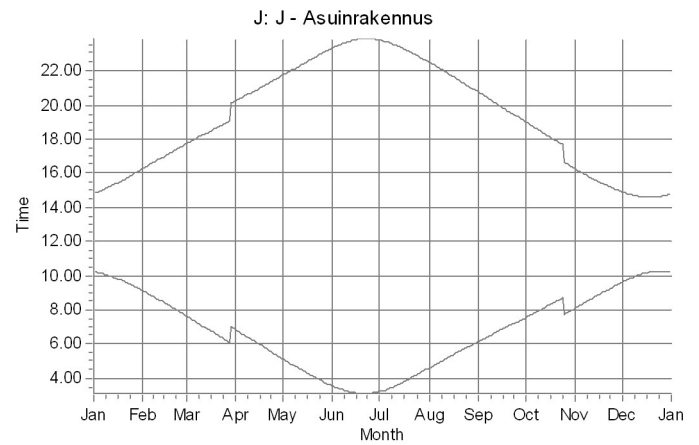
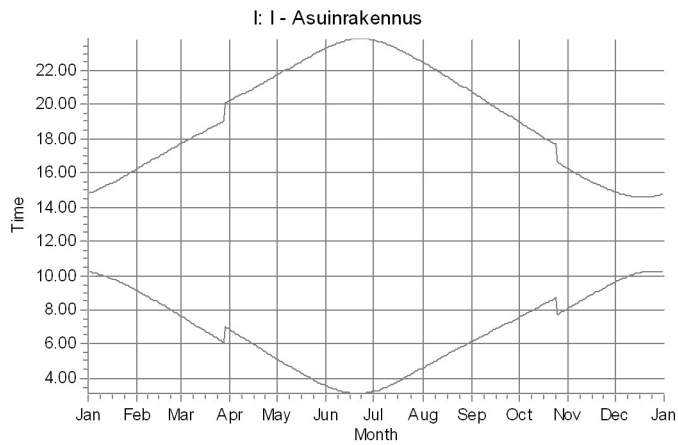
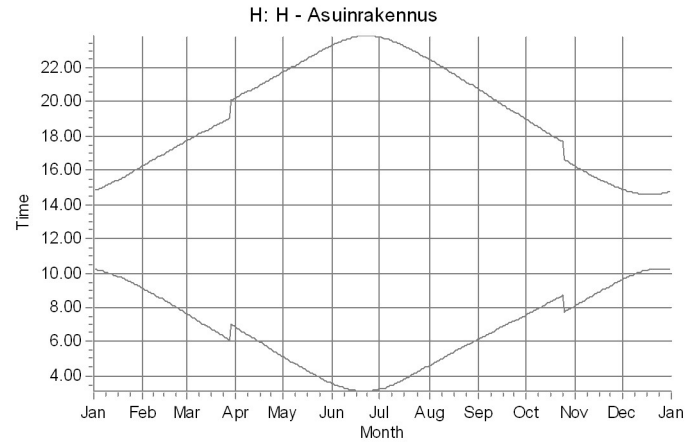
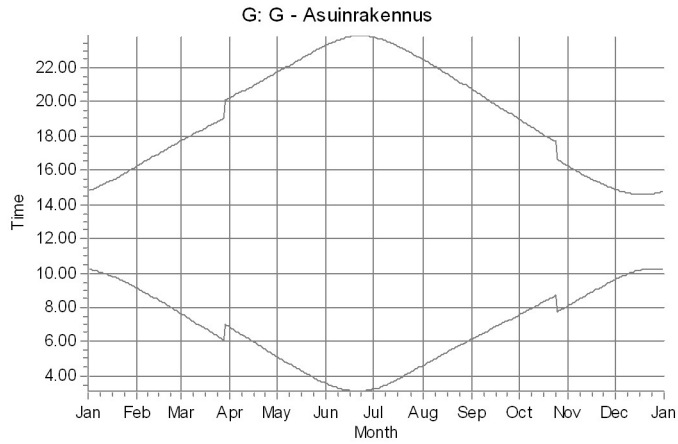
WTG 5: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (490)

WTG 7: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (494)

WTG 8: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (495)

SHADOW - Calendar, graphical

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025

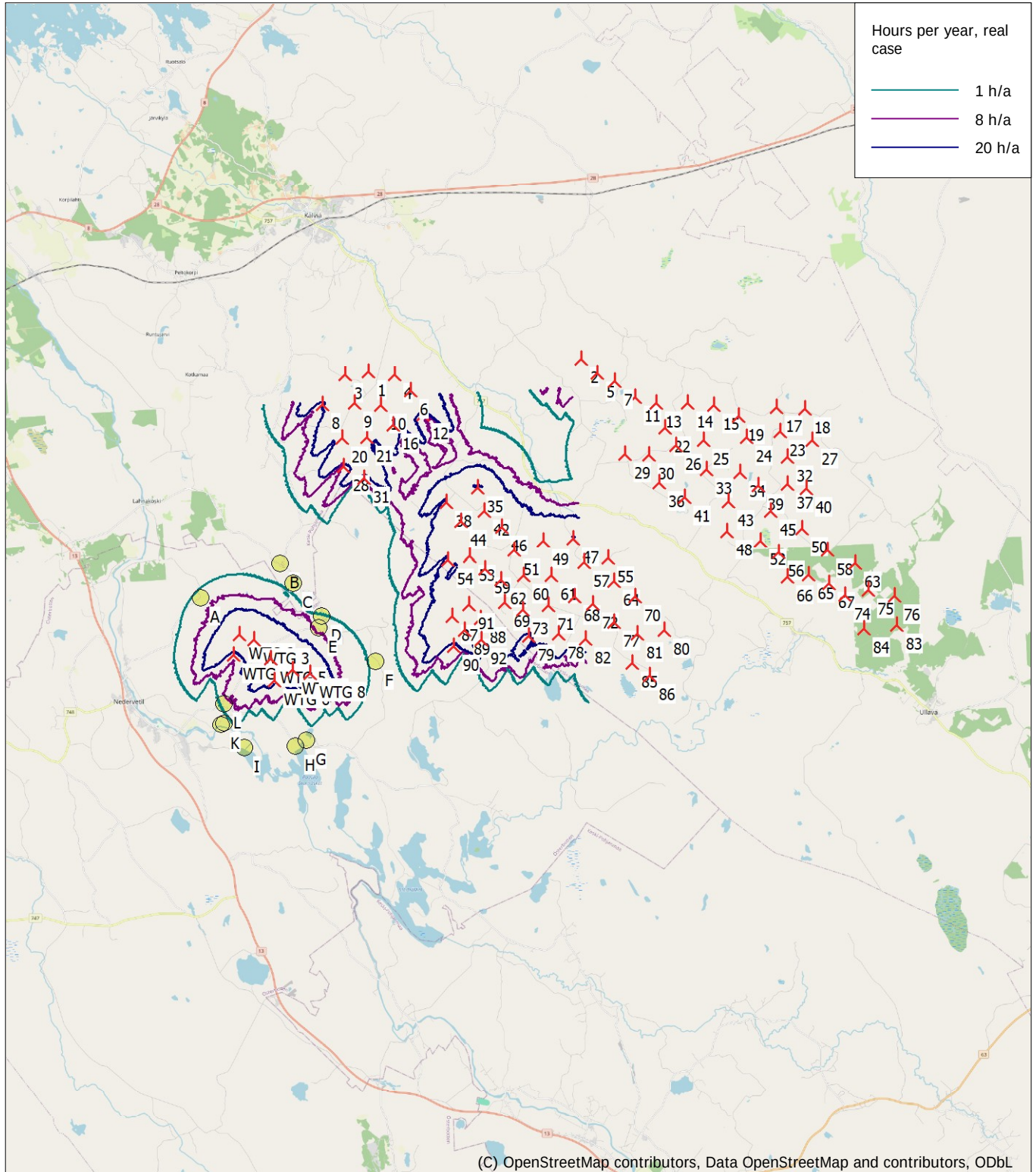


WTG4

WTG 6: Generic RD200 7200 200.0 Ht hub: 195.0 m (TOT: 295.0 m) (490)

SHADOW - Map

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_No_forest_291025



Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 331 481 North: 7 072 407
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m

**Bilaga 16. Resultat av modelleringen av sammantagna skuggeffekter "Real Case, Luke Forest" -
Projektalternativ ALT2**

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025
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) [UMEA]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1,02	2,84	3,78	6,14	8,62	9,94	7,42	5,13	4,32	3,43	1,58	0,96

Operational time

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW	Sum
658	501	405	380	500	735	1 005	1 175	840	615	500	540	7 854

Monthly aggregation of real case reduction

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:

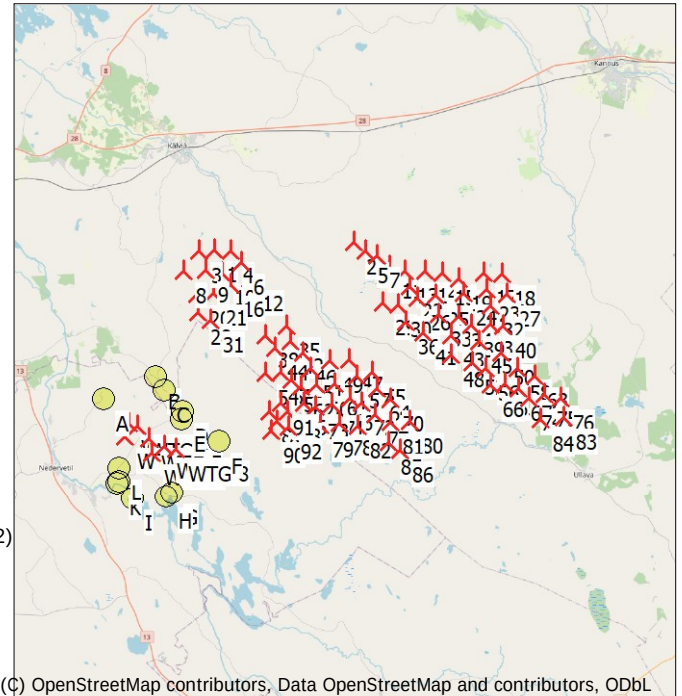
DHM: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)
Land cover data used in calculation:

Area object(s):

Area object (Heights a.g.l. for e.g. Forest (ORA tool) or ZVI

obstructions): REGIONS_Jolkka_meluvälkemallinnus_jk_0.w2r (5)

Receptor grid resolution: 1,0 m



All coordinates are in

Finish TM ETRS-TM35FIN-ETRS89

Scale 1:400 000

 New WTG

 Shadow receptor

WTGs

					WTG type			Shadow data				
	East	North	Z	Row data/Description	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Calculation distance [m]	RPM [RPM]
1	327 493	7 080 879	37,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
10	327 857	7 079 670	47,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
11	336 750	7 079 496	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
12	329 315	7 079 265	47,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
13	337 502	7 079 237	62,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
14	338 583	7 079 171	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
15	339 488	7 079 062	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
16	328 261	7 079 000	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
17	341 673	7 078 896	84,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
18	342 656	7 078 786	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
19	340 323	7 078 666	69,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
2	334 916	7 080 924	46,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
20	326 431	7 078 599	47,2	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
21	327 317	7 078 601	54,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
22	337 737	7 078 366	70,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
23	341 773	7 078 046	78,7	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
24	340 574	7 077 913	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
25	339 061	7 077 861	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
26	338 100	7 077 748	79,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
27	342 877	7 077 698	84,9	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
28	326 451	7 077 616	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
29	336 295	7 077 559	64,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
3	326 673	7 080 846	35,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
30	337 106	7 077 452	75,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
31	327 137	7 077 191	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
32	341 960	7 077 158	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
33	339 128	7 076 855	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
34	340 263	7 076 697	74,9	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
35	331 082	7 076 638	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
36	337 438	7 076 482	77,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
37	341 914	7 076 211	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4

To be continued on next page...

Project:

Jolkka_meluvälkemallinnus

Licensed user:

FCG Finnish Consulting Group Oy

Osmontie 34, PO Box 950

FI-00601 Helsinki

+358104095666

Henri Korhonen / henri.korhonen@fcg.fi

Calculated:

29.10.2025 12.41/4.1.273

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025

...continued from previous page

	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
			[m]									[RPM]
38	329 973	7 076 196	56,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
39	340 897	7 076 194	87,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
4	328 373	7 080 746	35,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
40	342 574	7 076 008	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
41	338 290	7 075 921	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
42	331 266	7 075 805	50,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
43	339 797	7 075 701	77,2	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
44	330 434	7 075 485	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
45	341 273	7 075 296	92,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
46	331 862	7 075 200	44,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
47	334 322	7 074 675	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
48	339 714	7 074 658	74,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
49	333 295	7 074 655	51,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
5	335 479	7 080 381	52,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
50	342 340	7 074 618	97,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
51	332 230	7 074 358	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
52	340 852	7 074 260	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
53	330 691	7 074 248	65,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
54	329 892	7 074 163	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
55	335 510	7 073 932	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
56	341 490	7 073 830	77,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
57	334 674	7 073 827	50,8	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
58	343 223	7 073 796	91,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
59	331 186	7 073 794	63,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
6	328 915	7 080 121	38,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
60	332 541	7 073 461	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
61	333 495	7 073 434	58,4	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
62	331 719	7 073 391	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
63	344 123	7 073 332	86,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
64	335 684	7 073 090	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
65	342 490	7 072 981	86,1	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
66	341 746	7 072 973	95,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
67	343 193	7 072 662	80,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
68	334 273	7 072 646	62,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
69	331 821	7 072 556	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
7	336 091	7 080 107	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
70	336 396	7 072 515	57,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
71	333 323	7 072 396	55,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
72	334 880	7 072 358	67,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
73	332 439	7 072 280	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
74	343 750	7 072 210	81,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
75	344 560	7 072 352	85,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
76	345 451	7 072 087	89,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
77	335 593	7 071 697	64,3	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
78	333 652	7 071 369	65,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
79	332 607	7 071 362	53,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
8	325 833	7 079 822	32,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
80	337 350	7 071 319	60,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
81	336 385	7 071 244	65,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
82	334 573	7 071 146	70,6	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
83	345 501	7 071 096	97,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
84	344 323	7 070 996	87,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
85	336 165	7 070 220	72,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
86	336 772	7 069 762	72,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
87	329 952	7 072 171	56,8	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
88	330 922	7 072 077	54,6	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
89	330 360	7 071 678	52,6	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
9	326 954	7 079 808	37,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	200,0	2 075	10,4
90	329 950	7 071 136	53,4	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
91	330 569	7 072 574	55,3	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
92	330 940	7 071 318	63,5	Generic RD200 HH200 72...	Yes	Generic	RD200 HH200-7 200	7 200	200,0	200,0	2 034	10,4
WTG 2	322 459	7 071 970	42,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 3	322 968	7 071 771	35,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5

To be continued on next page...

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025

...continued from previous page

	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
			[m]									[RPM]
WTG 4	322 233	7 071 257	44,6	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 5	323 504	7 071 059	45,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 6	323 609	7 070 303	45,5	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 7	324 270	7 070 629	45,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5
WTG 8	324 869	7 070 455	48,0	Generic RD200 7200 200....	Yes	Generic	RD200-7 200	7 200	200,0	195,0	2 083	10,5

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 A	- Asuinrakennus	321 194	7 073 316	32,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
B B	- Asuinrakennus	324 024	7 074 328	24,7	5,0	5,0	1,0	90,0	"Green house mode"	6,0
C C	- Asuinrakennus	324 459	7 073 641	29,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
D D	- Lomarakenus	325 375	7 072 435	30,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
E E	- Asuinrakennus	325 275	7 072 032	32,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
F F	- Lomarakenus	327 197	7 070 758	47,1	5,0	5,0	1,0	90,0	"Green house mode"	6,0
G G	- Asuinrakennus	324 595	7 068 088	51,4	5,0	5,0	1,0	90,0	"Green house mode"	6,0
H H	- Asuinrakennus	324 203	7 067 934	55,2	5,0	5,0	1,0	90,0	"Green house mode"	6,0
I I	- Asuinrakennus	322 423	7 067 969	42,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
J J	- Asuinrakennus	321 755	7 068 860	35,0	5,0	5,0	1,0	90,0	"Green house mode"	6,0
K K	- Asuinrakennus	321 664	7 068 837	33,5	5,0	5,0	1,0	90,0	"Green house mode"	6,0
L L	- Asuinrakennus	321 791	7 069 585	50,0	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 A	- Asuinrakennus	2:20
B B	- Asuinrakennus	0:00
C C	- Asuinrakennus	0:00
D D	- Lomarakenus	2:17
E E	- Asuinrakennus	4:34
F F	- Lomarakenus	0:00
G G	- Asuinrakennus	0:00
H H	- Asuinrakennus	0:00
I I	- Asuinrakennus	0:00
J J	- Asuinrakennus	0:00
K K	- Asuinrakennus	0:00
L L	- Asuinrakennus	0:00

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

No.	Name	Expected [h/year]
1	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (120)	0:00
10	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (129)	0:00
11	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (130)	0:00
12	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (131)	0:00
13	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (132)	0:00
14	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (133)	0:00
15	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (134)	0:00
16	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (135)	0:00
17	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (136)	0:00
18	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (137)	0:00
19	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (138)	0:00
2	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (121)	0:00
20	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (139)	0:00
21	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (140)	0:00
22	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (141)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025

...continued from previous page

No.	Name	Expected [h/year]
23	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (142)	0:00
24	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (143)	0:00
25	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (144)	0:00
26	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (145)	0:00
27	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (146)	0:00
28	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (147)	0:00
29	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (148)	0:00
3	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (122)	0:00
30	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (149)	0:00
31	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (150)	0:00
32	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (151)	0:00
33	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (152)	0:00
34	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (153)	0:00
35	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (154)	0:00
36	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (155)	0:00
37	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (156)	0:00
38	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (157)	0:00
39	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (158)	0:00
4	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (123)	0:00
40	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (159)	0:00
41	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (160)	0:00
42	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (161)	0:00
43	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (162)	0:00
44	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (163)	0:00
45	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (164)	0:00
46	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (165)	0:00
47	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (166)	0:00
48	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (167)	0:00
49	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (168)	0:00
5	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (124)	0:00
50	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (169)	0:00
51	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (170)	0:00
52	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (171)	0:00
53	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (172)	0:00
54	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (173)	0:00
55	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (174)	0:00
56	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (175)	0:00
57	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (176)	0:00
58	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (177)	0:00
59	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (178)	0:00
6	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (125)	0:00
60	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (179)	0:00
61	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (180)	0:00
62	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (181)	0:00
63	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (182)	0:00
64	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (183)	0:00
65	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (184)	0:00
66	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (185)	0:00
67	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (186)	0:00
68	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (187)	0:00
69	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (188)	0:00
7	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (126)	0:00
70	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (189)	0:00
71	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (190)	0:00
72	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (191)	0:00
73	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (192)	0:00
74	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (193)	0:00
75	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (194)	0:00
76	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (195)	0:00
77	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (196)	0:00
78	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (197)	0:00
79	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (198)	0:00
8	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (127)	0:00
80	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (199)	0:00
81	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (200)	0:00

To be continued on next page...

SHADOW - Main Result

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025

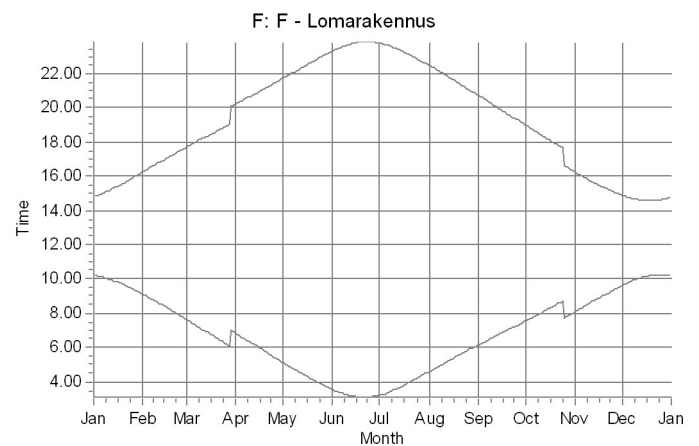
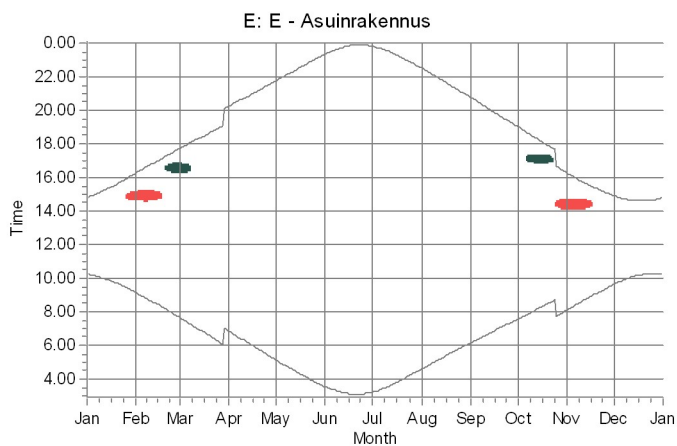
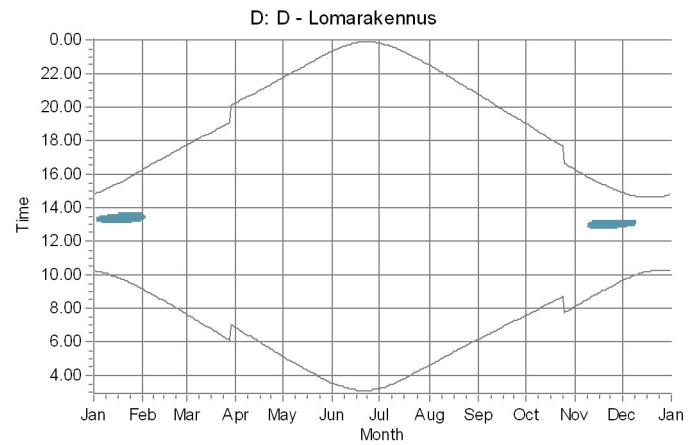
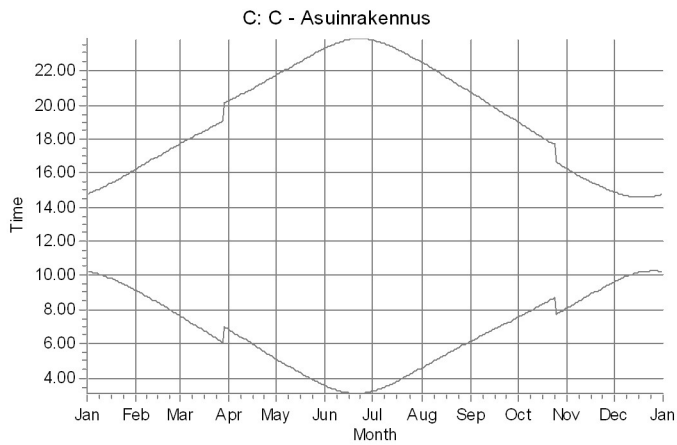
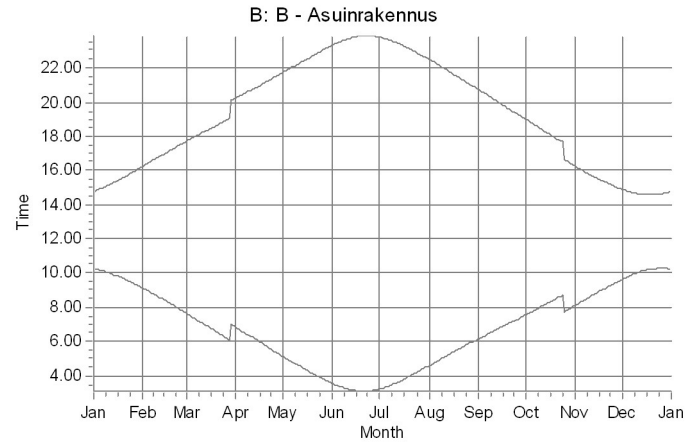
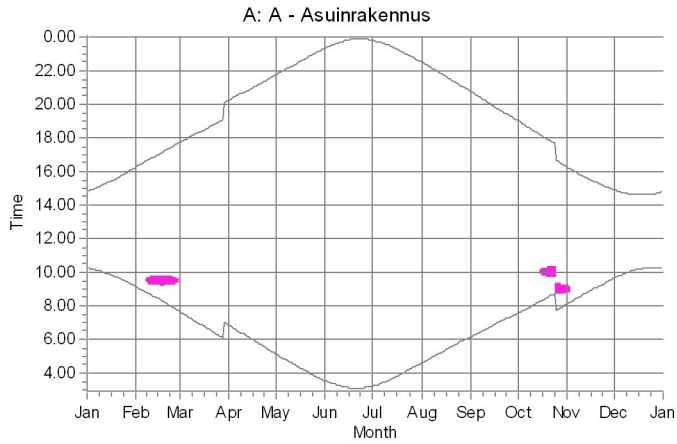
...continued from previous page

No.	Name	Expected [h/year]
82	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (201)	0:00
83	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (202)	0:00
84	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (203)	0:00
85	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (204)	0:00
86	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (205)	0:00
87	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (299)	0:00
88	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (300)	0:00
89	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (301)	0:00
9	Generic RD200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (128)	0:00
90	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (302)	0:00
91	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (303)	0:00
92	Generic RD200 HH200 7200 200.0 !O! hub: 200,0 m (TOT: 300,0 m) (304)	0:00
WTG 2	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (490)	2:20
WTG 3	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (489)	0:00
WTG 4	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (491)	0:00
WTG 5	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (493)	1:47
WTG 6	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (492)	0:00
WTG 7	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (494)	2:47
WTG 8	Generic RD200 7200 200.0 !O! hub: 195,0 m (TOT: 295,0 m) (495)	2:17

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: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025



WTG:

WTG 2: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (490)

WTG 5: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (490)

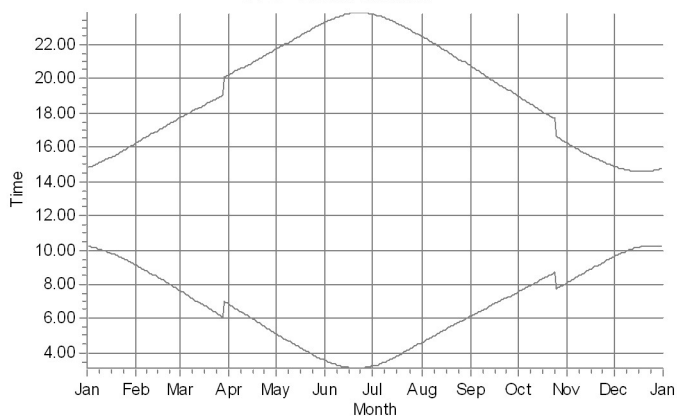
WTG 7: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (494)

WTG 8: Generic RD200 7200 200.0 ICI hub: 195.0 m (TOT: 295.0 m) (495)

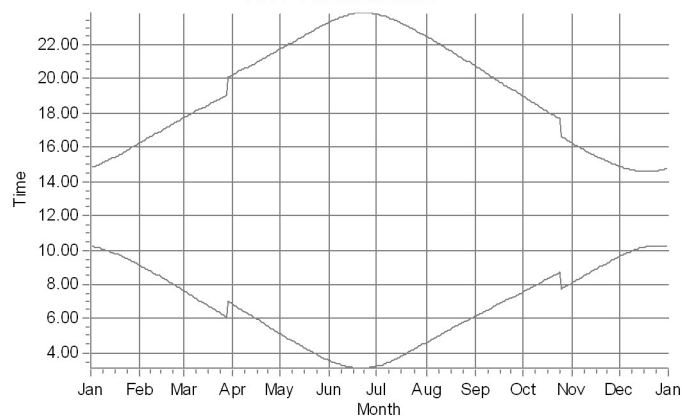
SHADOW - Calendar, graphical

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025

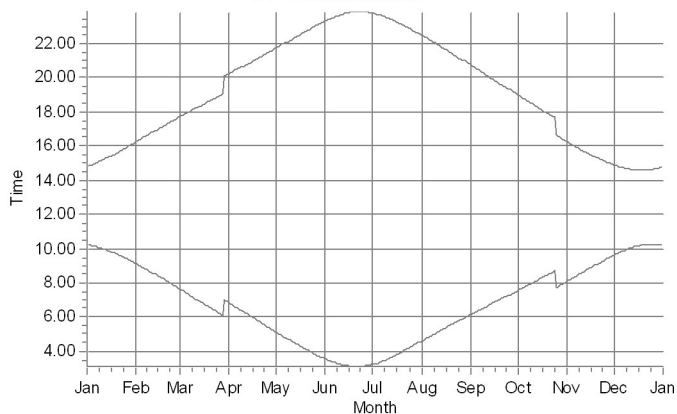
G: G - Asuinrakennus



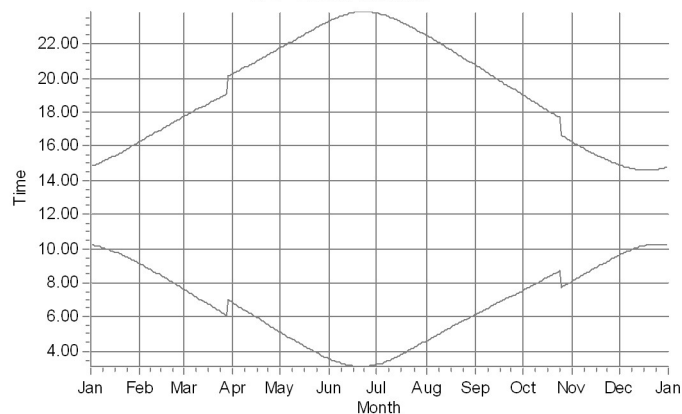
H: H - Asuinrakennus



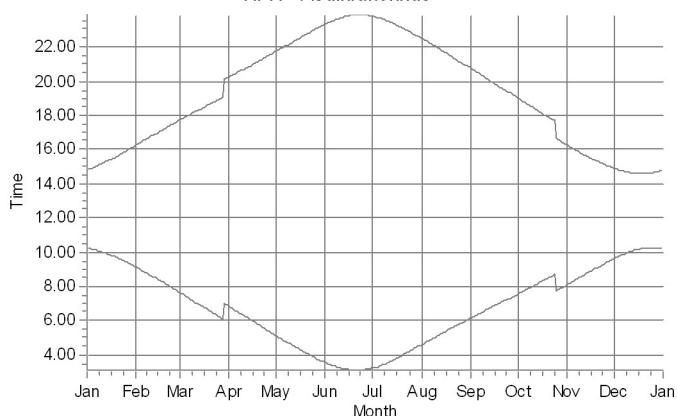
I: I - Asuinrakennus



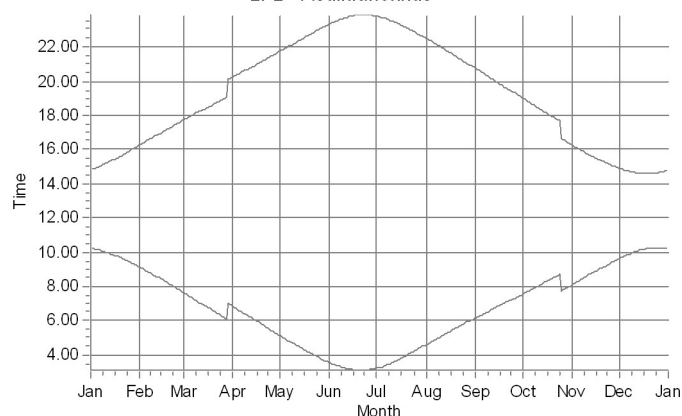
J: J - Asuinrakennus



K: K - Asuinrakennus



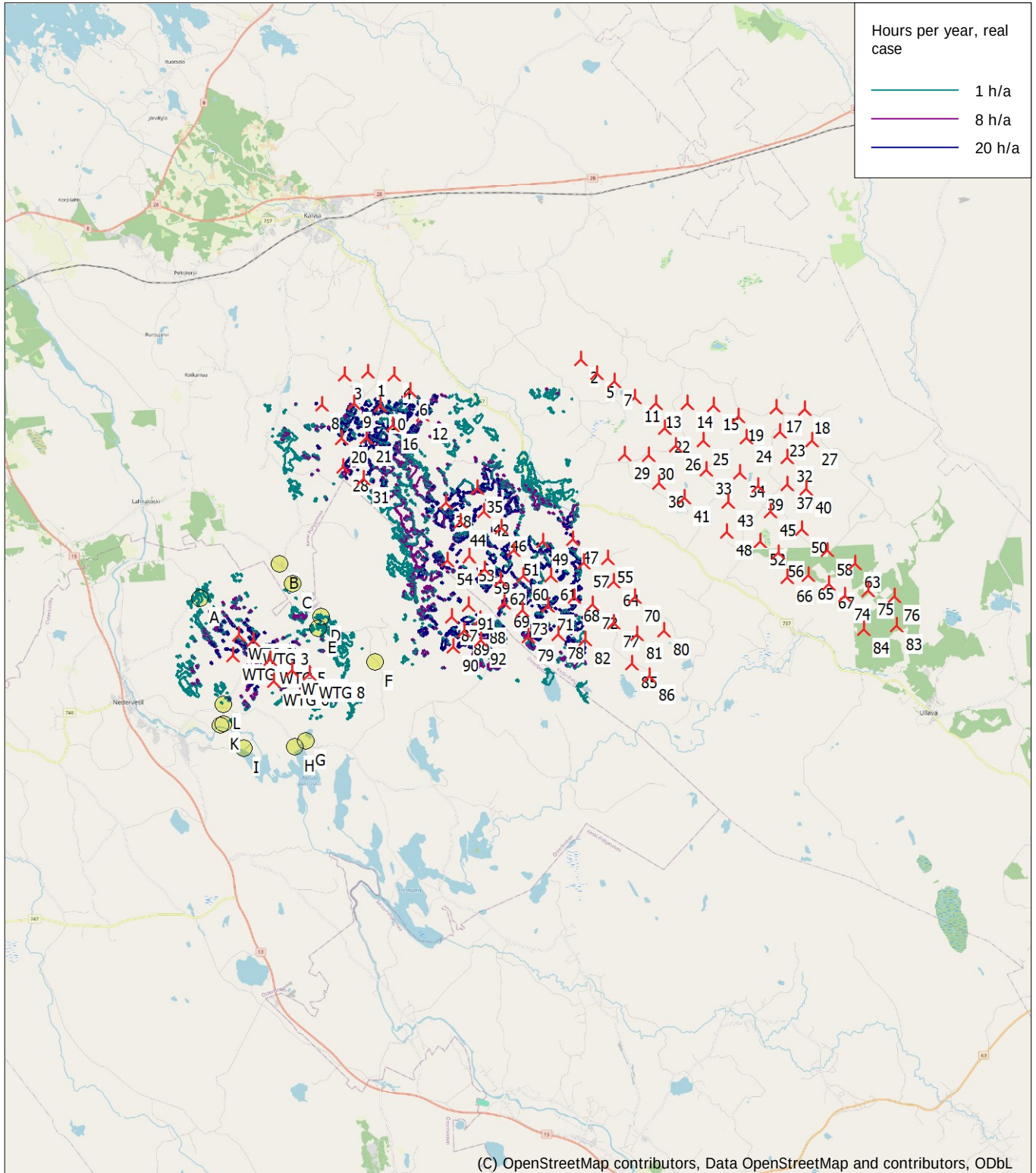
L: L - Asuinrakennus



WTG4

SHADOW - Map

Calculation: VE2_Jolkka_RD200x7xHH195_Pihtineva_VE1_RD200x86xHH200+Saaruka_RD200x6xHH200_Luke_forest_291025



Map: EMD OpenStreetMap , Print scale 1:200 000, Map center Finish TM ETRS-TM35FIN-ETRS89 East: 331 481 North: 7 072 407
 New WTG Shadow receptor
 Flicker map level: Height Contours: CONTOURLINE_Jolkka_meluvälkemallinnus_1.wpo (2)
 Time step: 4 minutes, Day step: 14 days, Map resolution: 30 m, Visibility resolution: 15 m, Eye height: 1,5 m