

# **Appendix A.17.1**

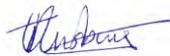
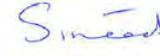
## **Embodied Carbon Emissions**

## Appendix A.17.1

## Document Verification

**Project title** N6 Galway City Ring Road  
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Revision	Date	Filename	Appendix A.17.1 Embodied Carbon Emissions
Issue 1	28 Mar 2025	<b>Description</b>	Issued for 2025 RFI Response

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Issue Document Verification with Document



EMBODIED CARBON EMISSIONS DATA						
Material Element	Embodied Carbon Construction - Emission Factor TC02e/Unit	Quantity of Material	Unit	Maintenance Percentage	Tonnes C02e	Comment/ Assumption
<b>Excavations</b>						
Excavations Hazardous Excavation Material	0.0010	7,538	m3	N/A	7.71	General Excavation
Excavations Peat	0.0004	75,933	m3	N/A	32.96	General Excavation - Peat
Excavations Topsoil	0.0007	183,497	m3	N/A	132.02	General Excavation - Topsoil
Excavations U1 Soil	0.001	147,452	m3	N/A	150.8	General Excavation
Excavations U1 Rock	0.0191	7,749	m3	N/A	148.4	General Excavation - rock
Blasted U1 Rock	0.0289	36,044	m3	N/A	1,048	Drilling, blasting and ripping of hard rock
Excavations Acceptable Earthworks	0.0010	1,343,027	m3	N/A	1,361.2	General Excavation
Excavations Acceptable Rock	0.0011	254,907	m3	N/A	275.2	General Excavation
Blasting Acceptable Rock	0.0289	1,016,914	m3	N/A	29,392	Drilling, blasting and ripping of hard rock
Excavation Marginal Material	0.0010	168,480	m3	N/A	172.4	General Excavation
<b>Total</b>					<b>32,727</b>	
<b>Site Clearance + Demolition</b>						
Residential Demolition	0.43	16.28	ha	N/A	7.04	
Commercial Demolition	0.43	2	ha	N/A	0.86	
Industrial Demolition	0.43	1.4	ha	N/A	0.60	
Site Clearance	0.43	180.3	ha	N/A	77.94	
<b>Total</b>					<b>86.46</b>	
<b>Structures</b>						
Reinforced Concrete	0.0002	298,967,400	kg	N/A	57,084	ICE 2019, Includes steel reinforcement 100kg rebar per m3 of concrete, Assuming steel rebar from European EAF recycled stock. Estimated from ICE Cement, Mortar, Concrete model.
Concrete In-Situ Stables	0.1020	1,379.2	T	N/A	140.7	ICE 2019, precast concrete RC40/50 with 50% GGBS Cement
Concrete Slabs Stables	0.2825	7,308	m3	N/A	2,064	ICE 2019, precast concrete slab RC40/50 with 50% GGBS Cement
<b>Total</b>					<b>59,289</b>	
<b>Pavement</b>						
Stone Mastic Asphalt	0.0068	693,840	m2	170%	12,689	TII TOOL, Dense asphalt concrete 14mm nominal size aggregate; depth: 40mm

AC20 50mm	0.0022	693,840	m2	N/A	1,549	TII TOOL, Granular Material Type 1 depth 100mm
AC32 200mm	0.0028	71,413	m2	N/A	201	TII TOOL, Granular Material Type 1 depth 150-200mm
AC32 260mm	0.0038	349,732	m2	N/A	1,330	TII TOOL, Granular Material Type 1 depth 250-300mm
AC32 190mm	0.0028	222,381	m2	N/A	626.6	TII TOOL, Granular Material Type 1 depth 150-200mm
AC32 250mm	0.0038	38,167	m2	N/A	145.2	TII TOOL, Granular Material Type 1 depth 250-300mm
Crushed Rock Chippings	0.0007	91,996	m2	354%	292.4	Surface dressing, coated chippings, nominal size 10mm
Sub-base 150mm	0.0010	679,012	m2	N/A	679.3	Unbound mixtures (type 1) depth 150-200mm
Steel Columns	0.3077	2,164	Nr	38%	918.9	Average height, assumed to be one every 20m on each side of the road
LED Lights	0.1082	1,710	Nr	38%	255.3	Assuming there is one every 20m, on each side of road
Aluminium Signs	0.4508	454	Nr	38%	282.5	Assuming speed every km on each side and 2 at each intersection
Reflecting Road Studs (cat eyes)	0.0035	51,300	Nr	125%	398.4	Assumed to be 3 rows of studs, placed every metre
Continuous Line Road Markings	0.0008	34,200	m	N/A	27.00	Assumed to be 2 continuous lines
Intermittent Line Road Markings	0.0009	68,400	m	N/A	59.40	Assumed to be 4 dashed lines
Letters and Shapes - Directional Arrow	0.0235	210	Nr	N/A	4.92	Assumed one at each interchange in each direction
Letters and Shapes - Give Way Triangle	0.0141	210	Nr	N/A	2.97	Assumed one at each interchange in each direction
Camera + Steel pole	1.57	4	Nr	N/A	6.30	Presumed value
Miscellaneous Cable	0.001	34,200	m	N/A	35.68	Assuming miscellaneous cable both directions for length of scheme
Concrete Kerbing	0.025	129,609	m	N/A	3,249	Length of perimeter of pavement
Earthworks Fill Stables	0.0059	22,132	m2	N/A	130.44	Granular material Type 2 depth 400-500mm
Granular Fill Stables	0.0046	16,816	m2	N/A	76.83	Granular material Type 1- Average
Rubberised Flooring Stables	0.0004	16,270	m2	N/A	6.48	Using geotextile factor
Retaining Wall Rebar	0.59	163.7	T	N/A	97.04	Assumed to be 4.05% of concrete volume, plain steel bar reinforcement
<b>Total</b>					<b>23,066</b>	
<b>Landscaping and Vegetation</b>						
N6 Clearance	0.43	180	ha	N/A	77.84	
Vegetation Removed	1.3	16.98	ha	N/A	22.03	
<b>Total</b>					100	
<b>Carbon Sink</b>						
Vegetation Added	26.7	30.42	ha	N/A	812.46	Subtracted - carbon sink
<b>Water and Energy</b>						
Water used from concrete production	1.47E-07	5,753,392	L	N/A	0.84	220L per m3 of concrete
Lighting Electricity	2.96E-04	1,126	kWh	N/A	0.33	Using LED lights running for 10 hours
Lighting Gasoil/Diesel	2.64E-03	120	L	N/A	0.32	Assuming portable lighting tower

Office Facilities Stables	2.96E-04	1,616	kWh	N/A	0.48	Using LED lights running for 10 hours
<b>Total</b>				N/A	<b>1.97</b>	
<b>Waste &amp; Material Movement</b>						
Recycled Construction Waste	0.0010	17,710	T	N/A	17.4	70% can be recycled
Landfill Construction Waste	0.2805	7,590	T	N/A	2,129	30% is sent to landfill
Recycled Demolition of Waste	0.0010	13,899	T	N/A	13.7	70% can be recycled
Landfill Demolition of Waste	0.2805	5,957	T	N/A	1,671	30% is sent to landfill
Hazardous Waste	0.1988	16,599	T	N/A	3,299	Taken to Dublin port to be brought overseas
Peat Material Movement	0.0100	86,469	T	N/A	868	Deposited in MDA
Temporary Stables Concrete Roofing Waste	0.0020	5,049	T	N/A	9.94	
Temporary Stables Green Roofing Waste	0.0173	169.7	T	N/A	2.94	
Temporary Stables Rubberised Surface Waste	0.0088	131.15	T	N/A	1.16	
Maintenance Aggregate Waste	0.0010	312,062	T	N/A	307.1	Taken every 20 years (i.e. 6 times over life of road)
<b>Total</b>					<b>8,320</b>	

#### TRANSPORT EMISSIONS

Transport Element	Vehicle	Carbon Emissions Factor (TCO2e/km)	Number of Journeys	Assumed Average Distance	Tonnes CO2e	Comment/ Assumptions
<b>Material</b>						
Concrete	HGV - All-Average	0.00085	17,326	25	369.41	Distance from Bearna to Coshla Quarry
Stone Mastic Asphalt	HGV - All-Average	0.00085	1,554	25	33.13	Distance from Bearna to Coshla Quarry
Asphalt Concrete	HGV - All-Average	0.00085	5,179	25	110.42	Distance from Bearna to Coshla Quarry
Crushed Rock Chippings	HGV - All-Average	0.00085	1,554	25	33.13	Distance from Bearna to Coshla Quarry
Sub-base 150mm	HGV - All-Average	0.00085	15,538	10	132.52	Assumed movement of Earthworks within Scheme
Earthworks Fill	HGV - All-Average	0.00085	256	10	2.18	Assumed movement of Earthworks within Scheme
Granular Fill	HGV - All-Average	0.00085	3,356	10	28.62	Assumed movement of Earthworks within Scheme
Rubberised Flooring	HGV - All-Average	0.00085	23	6.3	0.12	Assumed distance to supplier
Precast slabs	HGV - Articulated - Average	0.00085	661	25	14.09	Assumed distance to supplier
Retaining Wall Rebar	HGV - All-Average	0.00085	41	25	0.87	Assumed distance to supplier
Retaining Wall Concrete	HGV - All-Average	0.00085	41	25	0.87	Assumed distance to supplier
Loading Bays Concrete	HGV - All-Average	0.00085	585	25	12.47	Assumed distance to supplier

<b>Total</b>					<b>737.86</b>	
<b>Waste &amp; Material Movement</b>						
Hazardous Waste	HGV - All-Average	0.00085	754	226	145.30	Assumed distance to Dublin Port
C&D Waste	HGV - All-Average	0.00085	1387	186.25	220.25	Average Distance to local landfills
Peat deposition	HGV - All-Average	0.00085	11010	2.51	23.54	Average distance between start and end of scheme zones
Temporary Stables Concrete Roofing Waste	HGV - All-Average	0.00085	2	167.46	0.29	Average distance to landfill
Temporary Stables Green Roofing Waste	HGV - All-Average	0.00085	17	167.46	2.43	Average distance to landfill
Temporary Stables Rubberised Surface Waste	HGV - All-Average	0.00085	25	167.46	3.57	Average distance to landfill
<b>Total</b>					<b>395.37</b>	
<b>Transport Element</b>	<b>Fuel Type</b>	<b>Carbon Emissions Factor (TCO2e/L)</b>	<b>Fuel Use per hour</b>	<b>Total Days</b>	<b>Tonnes CO2e</b>	<b>Comment/ Assumptions</b>
<b>Vehicles during construction</b>						
Tractor with low loader	Gasoi/Diesel	0.00264	4.06	1276	136.65	Assumed 10 hours per day, 780 days N6, 248 days on Phase 1 + 3 of racecourse each
Wheel loader	Gasoi/Diesel	0.00264	18.90	1276	636.92	Assumed 10 hours per day, 780 days N6, 248 days on Phase 1 + 3 of racecourse each
Mobile crane	Gasoi/Diesel	0.00264	10.00	1028	271.50	Assumed 10 hours per day, 780 days N6, 124 days on Phase 1 + 3 of racecourse each
Teleporter	Gasoi/Diesel	0.00264	7.00	1028	190.05	Assumed 10 hours per day, 780 days N6, 124 days on Phase 1 + 3 of racecourse each
Road Sweeper	Gasoi/Diesel	0.00264	6.00	780	123.60	Assumed 10 hours per day, 780 days N6
<b>Total</b>					<b>1,359</b>	
<b>Vehicles during demolition</b>						
Excavator	Gasoi/Diesel	0.00264	9.1	40	9.61	Assumed 10 hours per day, 30 days N6, 10 days racecourse phase 4
Bulldozer	Gasoi/Diesel	0.00264	18.927	40	19.99	Assumed 10 hours per day, 30 days N6, 10 days racecourse phase 5
Dumptruck	Gasoi/Diesel	0.00264	3.5	40	3.70	Assumed 10 hours per day, 30 days N6, 10 days racecourse phase 6
<b>Total</b>					<b>33.31</b>	
<b>Maintenance of Materials</b>						
Stone Mastic Asphalt	Gasoi/Diesel	0.00264	3	7	0.028	Assumed 10 hours per day for 7 days, every 20 years
Crushed Rock Chippings	Gasoi/Diesel	0.00264	3	7	0.028	Assumed 10 hours per day for 7 days, every 20 years
Steel Columns	Gasoi/Diesel	0.00264	3	7	0.028	Assumed 10 hours per day for 7 days, every 20 years
Lights	Gasoi/Diesel	0.00264	3	7	0.028	Assumed 10 hours per day for 7 days, every 20 years
Aluminium Signs	Gasoi/Diesel	0.00264	3	7	0.028	Assumed 10 hours per day for 7 days, every 20 years

Reflecting Road Studs (cat eyes)	Gasoil/Diesel	0.00264	3	7	0.028	Assumed 10 hours per day for 7 days, every 20 years
Total					0.166	
<b>Mode of Transport</b>	<b>Carbon Emissions Factor (TCO2e/km)</b>	<b>No. of Employees</b>	<b>Man-days</b>	<b>Assumed Average Distance</b>	<b>Tonnes CO2e</b>	<b>Comment/ Assumptions</b>
<b>Employees to Site N6</b>						
Car	0.000248	100	780	25	483	Across 3 year period of scheme 5 days a week
Van	0.000178	150	780	25	520.2	Across 3 year period of scheme 5 days a week
<b>Employees to Site N6 Racecourse</b>						
Car	0.000248	4	526	25	13	248 days phases 1+3, 30 days phase 4
Van	0.000178	5	526	25	11.7	248 days phases 1+3, 30 days phase 4