Roadstone			
CO_2 Performance Ladder Version 3.1			
Value Chain Analysis 2024		**Document No.**	4A1-24FY-002
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Asphalt & Bitumen		**Revision Date**	06/10/2025
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1. Scope 3 Category of Importance & Focus

As per the 2024 Material Emissions Report generated by Roadstone this value chain analysis focuses on Asphalt as a Product. Asphalt accounts for Roadstones second highest total emissions by product group and also encompasses bitumen which a Scope 3 Category 1 material for Roadstone. Category 1 accounts for the highest Scope 3 emissions in Roadstone and Bitumen is the second highest ranking category 1 emitting material.

- Category 1: Purchased Goods and Services
- Focus: Bitumen procurement and asphalt production

2. Value Chain Description

This analysis covers the full value chain of asphalt, from raw material extraction, including bitumen (crude oil extraction, refining), aggregates and fillers (Roadstone and Non-Roadstone Sources) and additives and other materials, transport to the Roadstone plant, manufacturing, transport to site, laying/construction and end of life treatment. The chain analyses as per life cycle modules are outlined below:

- A1 – Raw Material Extraction
- A2 – Transport to Roadstone asphalt plant
- A3 – Manufacturing
- A4 – Transport to Site
- A5 – Construction
- C1 – De-construction & Planning
- C2 – Transport to Recycling Facility (Asphalt Plant)
- C3 – Recycling Process (Prepare the reclaimed asphalt mix for inclusion in new mixture).

3. Scope 3 Categories Involved

- Category 1: Purchased Materials (Bitumen, Aggregates & fillers, Admixtures & Additives)
- Category 3: Energy-related emissions (asphalt production)
- Category 4: Upstream transport
- Category 9: Downstream transport
- Category 12: End-of-life treatment

4. Quantification of Emissions

As per the Material Emissions Report 2024 Asphalt Emissions in the cradle to gate modules for Roadstone account for XXXXX tCO_2e and Bitumen as a Scope 3 Category 1 material accounts for XXXXX tCO_2e emissions, XXXXX % of asphalt total cradle to gate emissions. Using internal LCA models the emission intensity of asphalt in the cradle to gate life cycle stages for 2024 is XXXXX kg.CO2e/T. In 2025 Roadstone published 36 externally verified asphalt EPDs which can be used to further quantify the emissions associated with asphalt across the value life cycle. A wide range of mixture types were published as part of this exercise and the results give an insight into the effect of mix type, mixing temperature and reclaimed asphalt content (RAP) on the embodied CO2e of asphalt.

For the 36 mixes the A1-A3 embodied CO2e varied from 31.0 to 117.0 kg.CO2e with mixes with high dosages of RAP that reduces bitumen having the lowest values and mixes used in surface (SMA/HRA etc) courses having the highest values. Of the 36 mixes the below is the average percent of the emissions in each life cycle module. On average the full life cycle, excluding Module D loads and benefits has an embodied GWP of 88.7 kg.CO2e/T.

- A1 – Raw Material Extraction – 39%
- A2 – Transport to Roadstone asphalt plant – 8%
- A3 – Manufacturing – 28%
- A4 – Transport to Site – 9%
- A5 – Construction – 2%
- C1 – De-construction & Planning – 3%
- C2 – Transport to Recycling Facility (Asphalt Plant) – 9%
- C3 – Recycling Process (Prepare the reclaimed asphalt mix for inclusion in new mixture) – 2%

From Roadstones internal LCA models of the cradle to gate (A1-A3) emissions of asphalt the following results are determined:

- Bitumen Scope 3 Category 1 accounts for XXXXX% of the A1 emissions and 34% of the total A1-A3 emissions.
- Energy Scope 3 Category 1 accounts for XXXXX % of the total A1-A3 emissions.
- Energy Scope 1 & 2 accounts for XXXXX % of the total A1-A3 emissions.
- Upstream Transport Scope 3 Category 4 accounts for XXXXX % of the total A1-A3 emissions.

By removing the emissions associated with Scope 1 & 2 across the full life cycle of asphalt (Cradle to Grave/Cradle to Cradle), including removal of the Scope 1 & 2 emissions associated with aggregates Roadstone produce themselves for asphalt production, Roadstone's contracting services used in Roads construction and de-construction, Roadstones transport fleet utilised and Roadstone's emissions used in RAP recycling the Scope 3 emissions of concern for Roadstone across the full life cycle of asphalt are as follows:

- Bitumen Scope 3 Category 1 accounts for XXXXX **%** of Total Scope 3 Emissions.
- Downstream Transport Scope 3 Category 9 including transport to site and transport of reclaimed asphalt plannings back to asphalt plant accounts for XXXXX **%** of Total Scope 3 Emissions.
- Energy Scope 3 Category 3 accounts for XXXXX **%** of Total Scope 3 Emissions.
- Upstream Transport Scope 3 Category 4 accounts for XXXXX **%** of Total Scope 3 Emissions (60% of which is due to Bitumen).
- Additives & Admixtures Scope 3 Category 1 accounts for XXXXX **%** of Total Scope 3 Emissions.
- Purchased Aggregates Scope 3 Category 1 accounts for XXXXX **%** of Total Scope 3 Emissions.

This analysis indicates why a significant portion of the measures being implemented to reduce Scope 3 emissions on a company wide basis are related to bitumen. BY reducing the impact of bitumen not only will Scope 3 Category 1 be impacted, but also Scope 3 Category 4 upstream transport as according to EuroBitume figures the average sea transport distance of bitumen to Europe is greater than 7,000km.

5. **Value Chain Partners**

- Suppliers: XXXXX
- Transporters: Roadstone fleet and third-party logistics
- Production Sites: Roadstones 11 Asphalt Production Facilities
- Customers: Local authorities, contractors, infrastructure developers, Transport Infrastructure Ireland.

6. Data Sources

- Roadstone Verified EPDs (36 documents), available to view and download on the IES platform
- Supplier-specific emission factors
- Internal LCA database and external LCA software models
- Procurement and production records

7. Endorsement

As the asphalt EPDs produced and published by Roadstone are externally verified they are therefore acceptable as an endorsement. The EPDs were externally verified by Jane Anderson of Construction LCA www.constructionlca.co.uk and published on the International EPD System Portal. All 36 asphalt EPDs can be viewed and downloaded from the IES EPD library www.environdec.com/library. In addition by comparing the results of the EPDs for the same mixture types customers and clients can make informed decisions on how they can aid to reduce the emissions associated with asphalt such as by using warm mix asphalt to reduce mixing energy requirements and asphalt with high dosages of reclaimed asphalt to reduce the quantity and therefore emissions of bitumen in a mix.

8. Reduction Opportunities

Roadstone have two overarching absolute emissions reduction targets to 2030 from a 2021 baseline year.

- Reduce absolute gross Scope 1 and Scope 2 (Market-Based) emissions by 42%.
- Reduce absolute Scope 1, 2 (Market-Based) & 3 GHG emissions across the business by 30%.

In order to achieve both overarching targets the individual absolute gross Scope 1, Scope 2 (Market-Based) & Scope 3 reduction targets are 26%, 100% & 27.5%, respectively.

Roadstone have developed and are implementing a number of decarbonisation measures and associated action plan to achieve these targets with a number of the measures being directly related to asphalt and bitumen due to the ranking of these elements within Roadstone's overall material and product emissions tables.

- Transition to low-carbon bitumen alternatives such as bio-binders used by Roadstone on the N52 low-carbon road trial to reduce Scope 3 emissions.
- Increase use of recycled asphalt pavement (RAP) to replace virgin bitumen to reduce Scope 3 emissions.
- Improve energy efficiency in asphalt plants through the use of warm mix asphalt, 50,001 site energy efficiency plans and energy benchmarking, staff training & engagement and batching control optimisation to reduce primarily Scope 1 and also Scope 2 emissions.
- Implement on-site renewable solar electricity generation and procure certified green electricity to reduce Scope 2 emissions.
- Reduce Scope 3 emissions by prioritising the procurement of construction materials that are transparently documented through EPDs or equivalent emissions-specific data.
- Reduce emissions across the full value chain by actively engaging customers and clients to raise awareness of the carbon footprint of construction materials and promote the adoption of lower-carbon alternatives such as warm mix asphalt and high reclaimed asphalt mixes.
- Reduce Scope 3 emissions by optimising mix designs using advanced admixtures, performance-enhancing additives, and ongoing R&D, without compromising performance and durability.

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