ETHYPHARM UK LTD

LIFECYCLE CARBON ASSESSMENT

LCA

CARBON-ZERO

Authored by:	Fraser Christie and Mark Eadie
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Contents

1. Executive Summary

Ethypharm UK Limited (Ethypharm) have requested product lifecycle emissions analysis be conducted on a range of their products. Ethypharm provides around one hundred different products therefore a selection of their most frequently sold products has been chosen for this assessment, which has been conducted in accordance with PAS 2050 and the GHG Protocol Product Standard.

Due to their lightweight nature, the life cycle assessment has been upscaled to cover a batch of each product. The assessment includes the quantifying of emissions associated with the raw materials used, the manufacturing process, transport & distribution requirements, product use as well as product disposal.

Emissions have been determined using the UK government's BEIS emissions factor database. Where additional factors have been required as part of the assessment, the sources have been referenced. The greenhouse gases being measured in this report have been simplified to CO_2e (or CO_2 equivalent); CO_2e is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.

The emissions from each life cycle phase for the eight products assessed are summarised in the figure below.

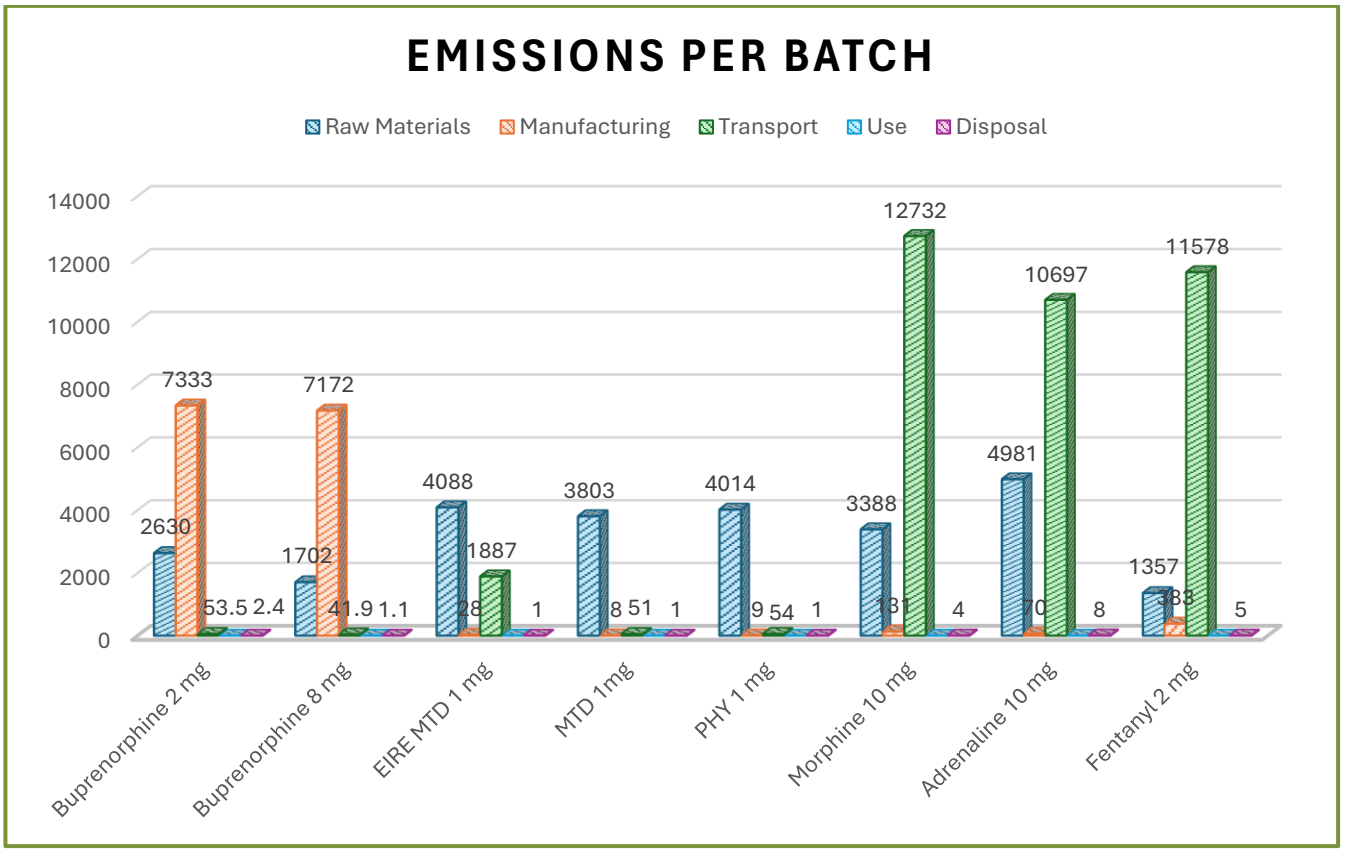


Fig.1 Emissions per Batch of Each Product

The average product life cycle emissions across the eight products assessed was calculated to be 9,777 Kg/CO_2e per batch.

2. Report Aims

This report will provide clear and quantifiable data on the product life cycle emissions associated with selected Ethypharm products. The agreed deliverables were as follows:

- Products to be assessed are Buprenorphine 2mg, Buprenorphine 8mg, EIRE MTD 1mg, MTD 1mg, Morphine 10mg, PHY 1mg, Adrenaline 10mg, and Fentanyl 2mg.
- Review the materials used in the production of each medication and required packaging.
- Determine key suppliers and transport routes for imported raw materials, and manufacturing locations for product completion.
- Determine lifecycle and end of life disposal routes.
- Compile a detailed breakdown of the carbon emissions associated with each life cycle stage.

3. Introduction to Greenhouse Gases and Reporting

Context		
In response to the increased awareness of global warming, international efforts have continued to reduce greenhouse gas emissions through the: • Rio Earth Summit, 1992 • Kyoto Protocol, 1997 • Copenhagen Accord, 2009	Most recently, the **Paris Climate Agreement** was signed which aims to bring all nations into a common cause to undertake more ambitious efforts to combat climate change and adapt to its effects.	Concern over climate change has stimulated interest in **estimating the total amount of greenhouse gasses (GHG)** produced during the different stages in **the life cycle of goods and services**. i.e. their production, processing transport, sale, use and disposal.
The outcome of these calculations is often referred to as **Product Carbon Footprints (PCFs) or Life Cycle Assessments (LCA)** where **'carbon footprint'** is the **total amount of GHGs produced** for a given activity and **'product'** is any **goods or services** that are marketed.	PCFs are thus distinct from GHG assessments performed at the level of projects, corporations, supply chains, municipalities, nations or individuals.	**PCF** is currently dominated by private standards and certification schemes operated by small for-profit and not-for-profit consultancies. Government support to PCF schemes and standards has been limited to the **PAS 2050 Standard**

What are some of the key benefits of undertaking Product Life Cycle Analysis?

1. **Performance Tracking**- To quantify the emissions associated with a product's production.
2. **Product Differentiation**- To compare similar products and identify the less carbon intensive option.
3. **Climate Change Management**- Provide product as 'Carbon Neutral' through offsetting.

4. Methodology

4.1 Relevant Standards

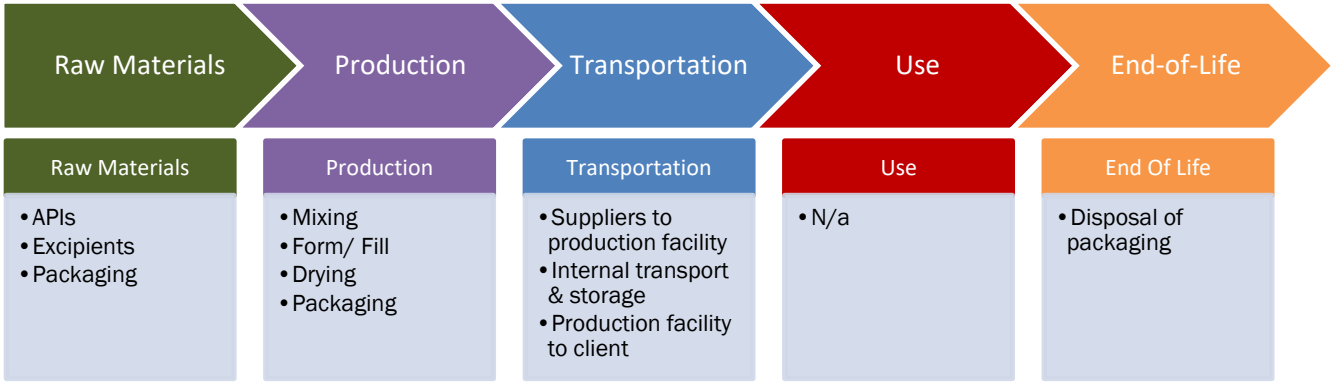
At an international level, carbon accounting standards are being developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD-WRI), through its GHG Protocol; and by the International Office for Standardisation[1]. The GHG protocol has developed a series of standards for business, organisations, cities, countries and products. The GHG Protocol Product Life Cycle Accounting and Reporting Standard has been followed for this emissions assessment.

In addition to the GHG protocol, BSI PAS 2050 and ISO 14068-1 standards have also been followed in this assessment. PAS 2050 is similar to the GHG protocol product standard and outlines the criteria for product carbon emissions assessments and reporting. ISO 14068-1, a standard designed to set out requirements for organisations wishing to achieve carbon neutrality, including for products (such as goods, services or events) made by the organisation. This standard was designed to supersede PAS2060 which is no longer in use. While this assessment has been conducted in accordance with ISO 14068-1, there is no obligation for Ethypharm to offset their emissions and achieve a carbon neutral status.

This should not be confused with delivering a product in accordance with Net-Zero. To do this the processes in which the product is constructed, manufactured, delivered to the point of delivery must be adapted to remove emissions, ideally to a maximum of 10-20% of the baseline total. This remaining percentage can then be offset to achieve a Net-Zero Status.

4.2 Data Gathering Process

A Product Carbon Footprint can be split into its five main life cycle phases, as identified by the GHG protocol product standard. When all five lifecycle phases are included in the assessment this is commonly referred to as a 'cradle to grave' assessment. The emissions generated at each phase are calculated and compared to better understand and reduce a product's carbon intensity. The five LCA phases undertaken by the products are detailed below, along with examples of emissions sources.

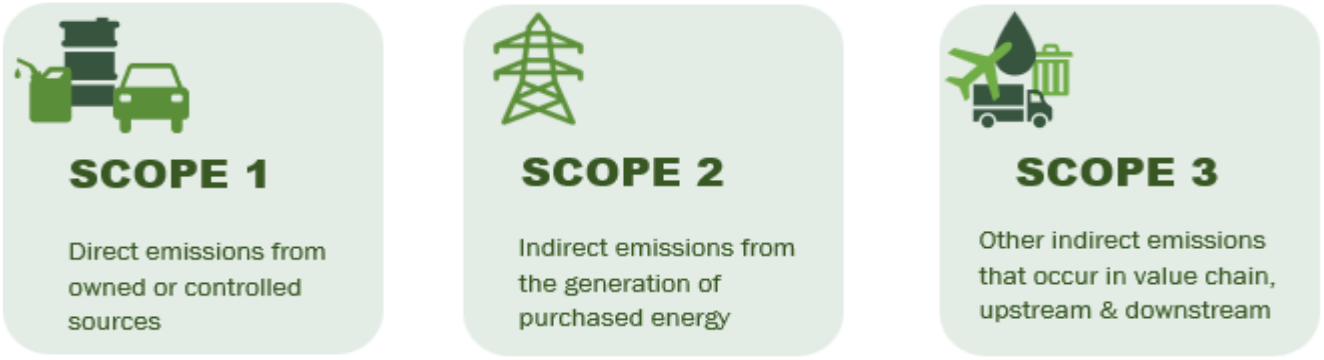


All data was gathered by Ethypharm and their suppliers and sent to Carbon-Zero in either word or excel format. Carbon-Zero were not given direct access to Ethypharm's system or raw files therefore cannot comment on how the raw data was tracked or retrieved. Primary data was provided which included the exact weights of materials used, and details of the manufacturing process. On rare occasions primary data was not available, the assumptions adopted have been listed in section 6 of this report.

[1] Simon Bolwig, Peter Gibbon (2009) Counting Carbon in the Marketplace. Global Forum on Trade: Trade and Climate Change, OECD.

4.3 Reporting Process

The results of this assessment have been documented in alignment with the GHG Protocol and reported as per scopes 1, 2 & 3. Examples of emissions sources as per these scopes are illustrated below.



Once the scope 1, 2 and 3 raw data was processed into a usable format the most suitable emissions factor is selected from the BEIS database. Any factors from external sources have been referenced in appendix I.

	UK Government GHG and BEIS Conversion Factors for **2025** applied
CO2e GHG	All Greenhouse Gases will be converted to the GWP (Global Warming Potential) of CO_2 and will be reported as CO_2 equivalent (CO_2e)

5. Scope of Assessment

The functional unit for this comparative and multi-product life cycle assessment is the delivery of one batch for each of the following eight pharmaceutical products: Buprenorphine 2 mg, Buprenorphine 8 mg, EIRE MTD 1 mg, MTD 1 mg, PHY 1 mg, Morphine 10 mg, Adrenaline 10 mg, and Fentanyl 2 mg.

The scope has been aligned to the GHG Protocol Product Life Cycle Accounting and Reporting Standard. The figure below details the emissions sources outlined in the standard, along with confirmation of their inclusion.

GHG Assessment Emissions Sources				Included in Scope
Category		Emissions Source Category (Aligned to GHG Protocol Product and Value Chain Standards)		
Scope 1		Direct emissions arising from owned, leased or directly controlled stationary sources that use fossil fuels in the manufacture of products		✓
		Direct emissions from owned, leased or directly controlled mobile sources, used in the manufacture or transportation of products		✓
Scope 2		Location-based emissions from the generation of purchased electricity, used in the manufacture of products		✓
Scope 3	Upstream	Purchased goods and services		✓
		Fuel and energy related activities (not included in Scope 1 or 2)	3rd party fuel use for product manufacturing	✓
			Upstream emissions of purchased fuels	✓
			Upstream emissions of purchased electricity	✓
			Transmission and distribution (T&D) losses	✓
		Upstream transportation & distribution.	Outbound courier deliveries of packages	✓
			Third-party transportation and storage of inbound production related goods	✓
		Waste generated	Waste treatment & transport	✓
		Upstream leased Assets	Operation of assets leased by the reporting company used for the manufacture of products and not included in scope 1 & 2.	✓
	Down stream	Downstream transportation & distribution	Third-party transportation and storage of outbound production related goods	✓
		Processing of Sold Products	Emissions from any post sale manufacture prior to installation/Use	✓
		Use of Sold Products	Energy Use for Installation, operation and maintenance	✓
		End of Life	Energy Use for removal and disposal	✓

A process flow has been included in appendix J which outlines each stage within the product's lifecycle that is included within the boundary of this assessment and highlights the activities undertaken. The flow for every product encompass the overall amount of the finished pharmaceutical product, along with its active ingredients and excipients, all packaging materials, and the comprehensive set of inputs for manufacturing, distribution, and end-of-life needed to provide one batch of therapeutic products. These reference flows are computed separately for each product and serve as the foundation for the life cycle emissions modelling.

6. Assumptions

To calculate the product life cycle emissions associated with a single batch of each product, the following assumptions have been established.

Material Use Assumptions

- All raw material used is primary material, unless otherwise stated.
- Methadone and Fentanyl emissions were based on those of Morphine as they are all derived from opioids.
- Mannitol emissions were based on those of fructose, as this is the primary input in Mannitol's production.
- Sodium Benzoate emissions were based on those of Benzoic acid.
- Gel Nonox emissions were based on those of gelatin.
- Disodium Edetate emissions were based on those of Disodium Disulfate.
- Adrenaline Tartrate emissions were based on those of amino acids.

Production Assumptions

- All manufacturing occurs in the UK therefore the grid mix for the UK has been applied.
- Buprenorphine 2mg & 8mg are produced by a third party and the energy requirement of the packaging process is not known. The average packaging energy requirement of the other 6 products (365 kWh) has been applied.

Transport Assumptions

- All incoming transport was assumed to be conducted using a >33t Heavy Goods Vehicle (HGV). Transport emissions have been calculated based on the percentage load requirement of a fully loaded 33t articulated HGV.
- Products are transported between the production and storage facility four times per day. It has been assumed one journey has been made per batch produced.
- Storage emissions were estimated using the assumption each pallet requires 30 kWh per year for cold storage[2] and the average storage time is 6 weeks.
- The distance for downstream shipments was calculated for each product based on the average distance to all suppliers made within the last year.
- It has been assumed goods shipped via air freight were sent to the nearest airport and onward overland travel to client facilities have been captured. Emissions from air freight were calculated using emissions factors for long haul/international shipments.

End-of-Life Assumptions

- All cardboard based packaging was assumed to be recycled on end of life.
- Blister packs and labels were assumed to be disposed of via energy recovery.

[2] STAR Refrigeration (2020) Energy Use- You Cant Manage What You Don't Measure, Cold Chain Federation, available https://www.coldchainfederation.org.uk/energy-use-you-cant-manage-what-you-dont-measure/

7. Product Life Cycle Assessment

Ethypharm have requested Product Life Cycle Analysis be conducted on a range of their products. Due to the diverse nature of their product lines this assessment has selected eight of their most frequently produced products to be assessed.

7.1 Raw Materials

Embodied emissions are the emissions associated with the extraction of the raw material required to manufacture each product. Each product assessed contains active pharmaceutical ingredients as well as excipients. The embodied emissions of the packaging materials (paper, card and plastics) have also been considered.

The materials and exact weights used in each product, including packaging materials, are detailed in the relevant appendices. The table below summarises the embodied emissions for each product assessed.

Product	Product Weight per Batch (kg)	Packaging weight per Batch (kg)	Emissions (kg/ CO_2e)
Buprenorphine 2mg	159.0	524.3	2,630
Buprenorphine 8mg	228.0	228.2	1,701
EIRE MTD 1mg	3,447.7	298.6	4,088
MTD 1mg	3,646.7	278.5	3,803
PHY 1mg	3,447.7	271.8	4,014
Morphine 10mg	3,357.7	759.3	3,388
Adrenaline 10 mg	2.0	1,678.2	4,981
Fentanyl 2mg	3.6	1,093.2	1,357

Table 1–Embodied Emissions Summary

The average embodied emissions across all products were calculated to be 3,245 kg/CO_2e per batch.

7.2 Manufacturing Emissions

Manufacturing emissions are generated through the energy consumed in the product production and packaging processes. Production is undertaken at both Ethypharm's Romford facility, and at third party sites.

The power requirement for each manufacturing process was calculated using the equipment power ratings and production times provided by Ethypharm. The emissions from each process step within production is detailed in the product appendices. There is no notable waste reported as part of the manufacturing processes. The table below summaries the total production emissions for each product.

Product	Product Production Emissions (kg/ CO_2e)	Packaging Emissions (kg/ CO_2e)	Total Emissions (kg/ CO_2e)
Buprenorphine 2mg	7,246	88	7,334
Buprenorphine 8mg	7,084	88	7,173
EIRE MTD 1mg	11	16	28
MTD 1mg	6	2	8
PHY 1mg	6	3	9
Morphine 10mg	23	108	131
Adrenaline 10 mg	0	70	70
Fentanyl 2mg	53	330	383

Table 2–Production Process Total Emissions Summary

Manufacturing emissions vary greatly across the product range with Buprenorphine 8mg emitting over 7

T/CO_2e per batch, compared to MTD 1mg emitting 0.008 T/CO_2e per batch. The main cause of the emissions variance was the freeze-drying process within the production phase. Only two products require this energy intensive process as they are in tablet form. On average freeze-drying generates 6.85 T/CO_2e per batch. This is equivalent to approximately 95% of the total manufacturing emissions for these two products. Without this process the manufacturing emissions of these two products would be similar to those of Fentanyl 2mg.

The average manufacturing emissions across all products was calculated to be 1,892 kg/CO_2e per batch. For products requiring freeze-drying (Buprenorphine 2mg & 8mg) the average emissions are 7,253 kg/CO_2e per batch. For the remaining six products the average manufacturing emissions were 105 kg/CO_2e per batch.

7.3 Transportation, Distribution and Storage Emissions

The raw materials required to produce Ethypharm's products are shipped to a production facility based in Romford. On completion products are transferred to a storage facility in Brentwood before onward shipping to client locations.

The journey distance for each inbound shipment has been adjusted based on the percentage load share. All shipments were assumed to be made by fully loaded 33t+ Heavy Goods Vehicles (HGVs).

Transfer and storage emissions have been based on Ethypharm's 18t HGV making one journey to the storage facility per batch. Storage emissions were estimated using the assumption each pallet requires 30 kWh per year for cold storage and the average storage time is 6 weeks.

The overland travel for shipments made via air freight were assumed to be made via HGV to the nearest airport.

The table below summarises the emissions for each product. A breakdown of distances, transport types and emissions for each product is included in the appendices.

Product	Emissions (kg/ CO_2e)				
	Upstream	Transfer & Storage	Downstream-Land	Downstream-Air	Total
Buprenorphine 2mg	23	21	8	0	**52**
Buprenorphine 8mg	16	21	5	0	**42**
EIRE MTD 1mg	27	21	10	1,829	**1,887**
MTD 1mg	4	20	27	0	**51**
PHY 1mg	18	20	16	0	**54**
Morphine 10mg	7	22	25	12,678	**12,732**
Adrenaline 10 mg	14	21	26	10,636	**10,697**
Fentanyl 2mg	14	21	5	11,539	**11,578**

Table 3–Transportation Emissions Summary

The emissions from upstream transport, storage and downstream land transport are relatively consistent across the products. The total emissions are significantly impacted by the distance each product is transported by air. EIRE MTD 1mg air emissions are lower as this product is only shipped to Ireland, where the other products are shipped globally.

The average emissions generated from the transportation of all products are highlighted below

The average transportation emissions across all products is 4,637 Kg/CO_2e per batch.

For products requiring air freight, highlighted in table 3, the average transportation emissions are 9,222 Kg/CO_2e per batch. For products that are shipped domestically, without air freight, the average transportation emissions are 50Kg/CO_2e per batch.

7.4 Use/ Maintenance Emissions

All products are taken/administered manually therefore there are no emissions associated with the 'use' phase.

7.5 End of Life Emissions

The emissions generated from the 'End-of-Life' phase of a product's lifecycle are generated through product disposal/recycle. As the products are consumed there are only waste emissions associated with the packaging.

It was assumed all packaging would be recycled after the products are administered. The average disposal emissions across the eight products assessed was 3 Kg/CO_2e per batch. The emissions for each material type associated with all products are detailed in the appendices.

8. Emissions Summary

The product life cycle emissions per batch is summarised in the table below. The average product life cycle emissions of all eight products assessed was 9,777 Kg/CO_2e per batch.

Product	Raw Materials (kg/ CO_2e)	Manufacturing (kg/ CO_2e)	Transportation (kg/ CO_2e)	End of Life (kg/ CO_2e)	Total Emissions (kg/ CO_2e)
Buprenorphine 2mg	2,630	7,334	52	2	10,019
Buprenorphine 8mg	1,701	7,173	42	1	8,917
EIRE MTD 1mg	4,088	28	1,887	1	6,005
MTD 1mg	3,803	8	51	1	3,864
PHY 1mg	4,014	9	54	1	4,078
Morphine 10mg	3,388	131	12,732	4	16,254
Adrenaline 10 mg	4,981	70	10,697	8	15,756
Fentanyl 2mg	1,357	383	11,578	5	13,323
Average	**3,245**	**1,892**	**4,637**	**3**	**9,777**

Table 4–LCA Emissions Summary

Transport accounts for the largest contribution to life cycle emissions with an average make up of 47%. Figure two below highlights the average percentage of total emissions for each of the life cycle stages.

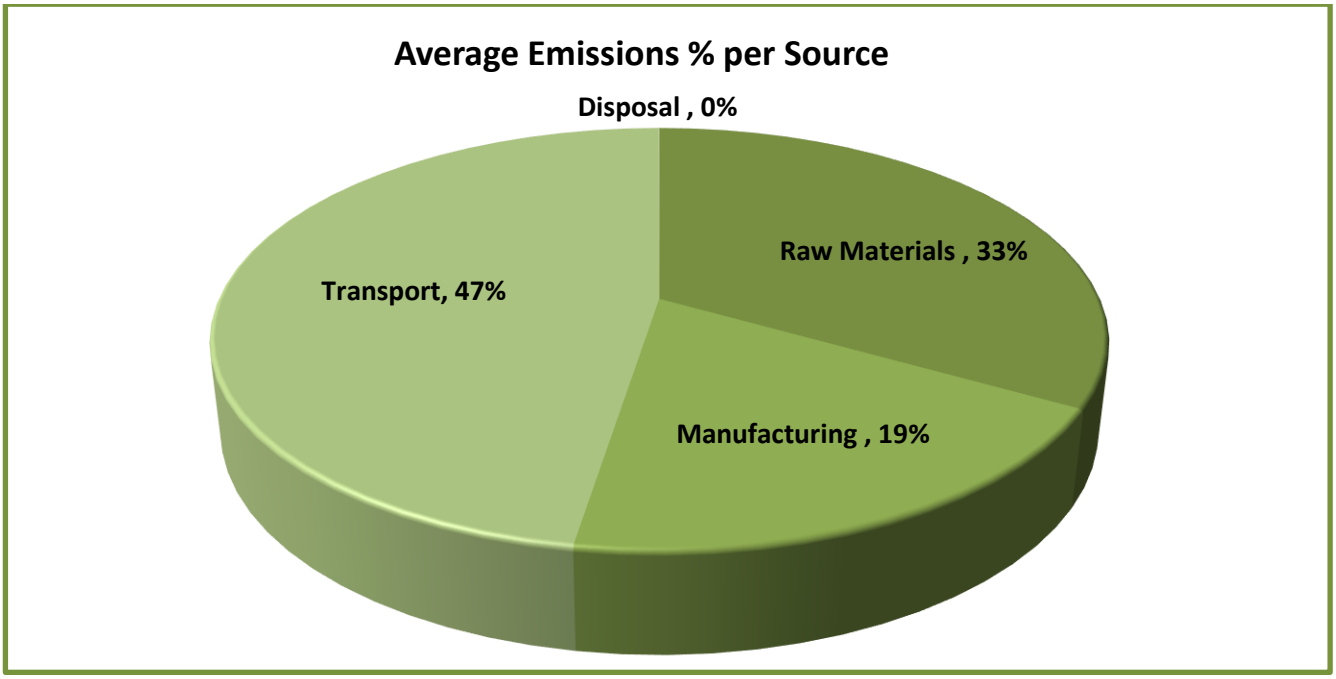


Fig.2 Average Emissions per Source (%)

The percentage contribution of emissions for each phase is detailed below for all products.

Product	Raw Materials (%)	Manufacturing (%)	Transportation (%)	End of Life (%)
Buprenorphine 2mg	26.3%	73.2%	0.5%	0.0%
Buprenorphine 8mg	19.1%	80.4%	0.5%	0.0%
EIRE MTD 1mg	68.1%	0.5%	31.4%	0.0%
MTD 1mg	98.4%	0.2%	1.3%	0.0%
PHY 1mg	98.4%	0.2%	1.3%	0.0%
Morphine 10mg	20.8%	0.8%	78.3%	0.0%
Adrenaline 10 mg	31.6%	0.4%	67.9%	0.0%
Fentanyl 2mg	8.6%	2.4%	73.5%	0.0%
Average	**33.2%**	**19.4%**	**47.4%**	**0.0%**

Table 5–Emissions % Contribution from Each LCA Phase

The total emissions for each product at all life cycle stages are detailed in figure 3 below. The figure highlights how manufacturing and transport emissions have significant variations in emissions across the product line. It also highlights the difference in emissions across the LCA stages with the Use and Disposal phases failing to register on the chart.

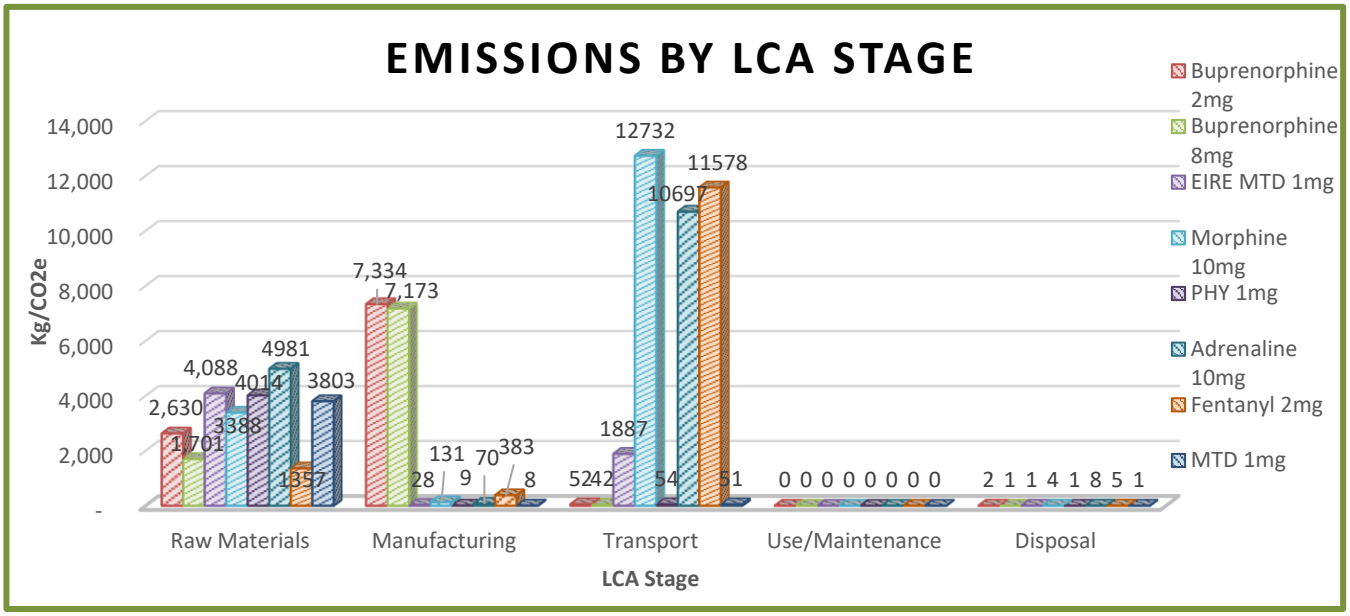


Fig.3 Total Emissions by LCA Stage

The discrepancy in transport emissions between products is caused by some products requiring air freight. As EIRE MTD 1mg is only shipped by air to Ireland the air freight emissions are smaller than products with global air shipping.

Buprenorphine 2mg & 8mg are the only products that require freeze-drying as part of the production process. This step is very energy-intensive and accounts for around 95% of the production emissions for these products.

Disposal emissions range between 1-8 Kg/CO_2e across the products therefore are not significant enough to register on the chart. There are no use phase emissions for any products therefore this will also not appear in figure 3.

The emissions per Scope of each product have been analysed and on average 85.6% of emissions fall within Scope 3, 14.2% fall within Scope 2, and the remaining 0.1% fall within Scope 1. The Scope 1 percentage is low as the only Scope 1 emissions source within the product lifecycles is the transport of products from the manufacturing site to the storage facility. It is calculated this journey emits just 13 Kg/CO_2e per batch. Figure 4 below highlights the emissions per Scope for each product. Scope 1 emissions and Scope 2 emissions for some products are not significant enough to register on the chart.

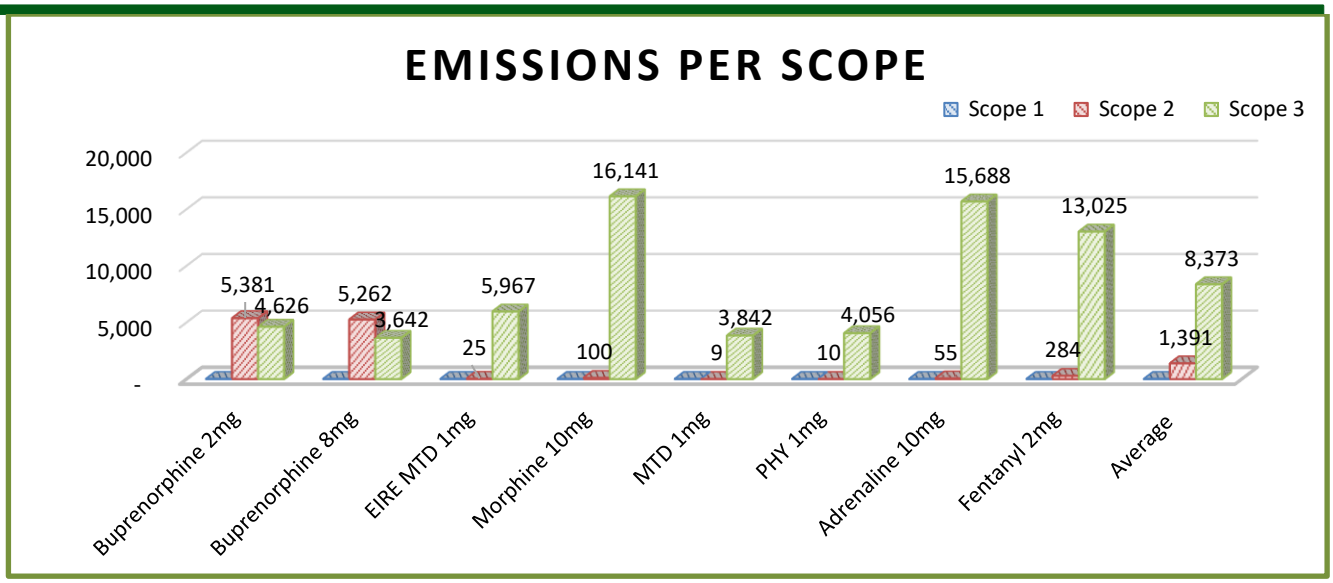


Fig.4 Emissions per Scope

Figure 5 below details the emissions per dose of each product. On average 879 g/CO_2e are emitted per dose.

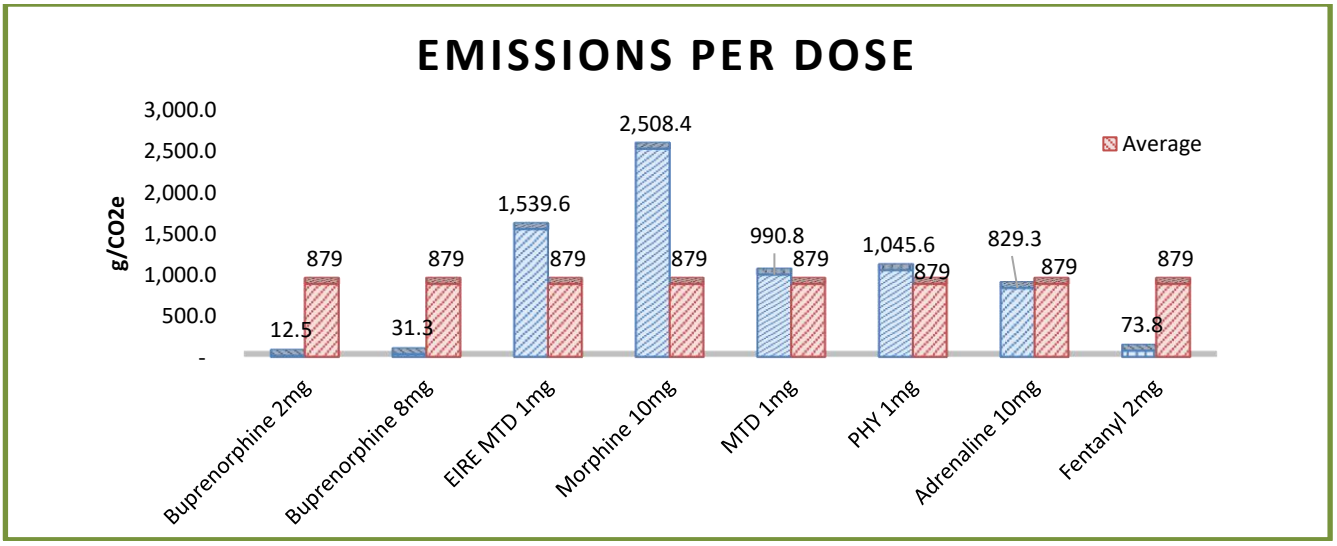


Fig.5 Emissions per Dose

The quantity of doses per batch varies greatly across the products assessed. For example, Buprenorphine 2mg contains 800,000 doses per batch, compared to just 3,900 doses for EIRE MTD 1mg, MTD 1mg and PHY 1mg.

9. Contact Details

Carbon-Zero UK (A division of Data Engineering Projects Limited)
272 Bath Street
Glasgow
G2 4JR
Email: meadie@carbon-zero.uk
fchristie@carbon-zero.uk
Website: www.carbon-zero.uk
Telephone: 01224 049169

Appendix A – Buprenorphine 2mg (Per Batch)

Life Cycle Stage	Classification	Category	Units	Quantity	Description	Emissions Factor	Carbon Emissions (kilograms CO2e)	Carbon Emissions %
Raw Materials	Material Use- Product	Buprenorphine HCL	Kg	1.71394		240	411	4.1%
	Material Use- Product	Purified Water	Kg	142.91116		0.000399	0	0.0%
	Material Use- Product	Mannitol	Kg	5.5014		2.3600	13	0.1%
	Material Use- Product	Aspartame	Kg	0.3975		29.25	12	0.1%
	Material Use- Product	Mint 51.296 Powder	Kg	0.318		0.173	0	0.0%
	Material Use- Product	Citric Acid	Kg	0.844		2.44	2	0.0%
	Material Use- Product	Gel Nonox (Gelita)	Kg	7.314		30.665	224	2.2%
	Material Use- Packaging	Card	Kg	41.3	Corrugated Shipper	1.19973	49	0.5%
	Material Use- Packaging	Card	Kg	73.2	Magazine	1.19973	88	0.9%
	Material Use- Packaging	Film	Kg	307.37	Blister pack	2.9165	897	9.0%
	Material Use- Packaging	Foil	Kg	102.46	Blister pack	9.1159	934	9.3%
Production	Electricity- Production	UK Electricity	kWh	950	Mixing	0.24143	229	2.3%
	Electricity- Production	UK Electricity	kWh	171	Form/Fill/Freeze	0.24143	41	0.4%
	Electricity- Production	UK Electricity	kWh	28,600	Freeze Drying	0.24143	6,905	68.9%
	Electricity- Production	UK Electricity	kWh	291	Sealing	0.24143	70	0.7%
	Electricity- Packaging	UK Electricity	kWh	366		0.24143	88	0.9%
Transportation	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.02	Buprenorphine HCL	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	3.00	Purified Water	1.72072	5.2	0.1%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.03	Mannitol	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	Aspartame	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Mint 51.296 Powder	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Citric Acid	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.12	Gel Nonox (Gelita)	1.72072	0.2	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.14	Corrugated Shipper	1.72072	0.2	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.18	Magazine	1.72072	0.3	0.0%

	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	7.5	Blister pack	1.72072	12.9	0.1%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden- WTT	miles	11.0	All deliveries	0.40710	4.5	0.0%
	Internal Transport	Rigid - (>8t) Average Laden	miles	8	Romford to Brentwood	1.59575	13	0.1%
	Internal Transport	Rigid - (>8t) Average Laden-WTT	miles	8	Romford to Brentwood	0.38231	3	0.0%
	Storage- Electricity		kWh	21	Cool Storage	0.24143	5	0.0%
	Downstream	HGV - (>33t) 100% Laden	miles	3.79	Ethypharm to client	1.72072	7	0.1%
	Downstream	HGV - (>33t) 100% Laden- WTT	miles	3.79	Ethypharm to client	0.40710	2	0.0%
Use	n/a							0.0%
End Of Life	Waste Disposal	Card	Kg	41.3	Corrugated Shipper	0.00469	0.2	0.0%
	Waste Disposal	Plastic	Kg	73.2	Magazine Card	0.00469	0.3	0.0%
	Waste Disposal	Film	Kg	307.37	Blister pack	0.00469	1.4	0.0%
	Waste Disposal	Foil	Kg	102.46	Blister pack	0.00469	0.5	0.0%
						Grand Total	**10,019**	

Appendix B – Buprenorphine 8mg (Per Batch)

Life Cycle Stage	Classification	Category	Units	Quantity	Description	Emissions Factor	Carbon Emissions (kilograms CO2e)	Carbon Emissions %
Raw Materials	Material Use- Product	Buprenorphine HCL	Kg	2.45775		240	590	6.6%
	Material Use- Product	Purified Water	Kg	204.94335		0.000399	0	0.0%
	Material Use- Product	Mannitol	Kg	7.8888		2.3600	19	0.2%
	Material Use- Product	Aspartame	Kg	0.57		29.25	17	0.2%
	Material Use- Product	Mint 51.296 Powder	Kg	0.456		0.173	0	0.0%
	Material Use- Product	Citric Acid	Kg	1.1961		2.44	3	0.0%
	Material Use- Product	Gel Nonox (Gelita)	Kg	10.488		30.665	322	3.6%
	Material Use- Packaging	Card	Kg	33.98	Corrugated Shipper	1.19973	41	0.5%
	Material Use- Packaging	Card	Kg	48.25	Magazine	1.19973	58	0.7%
	Material Use- Packaging	Film	Kg	109.50	Blister pack	2.9165	319	3.6%
	Material Use- Packaging	Foil	Kg	36.50	Blister pack	9.1159	333	3.7%
Production	Electricity- Production	UK Electricity	kWh	950	Mixing	0.24143	229	2.6%
	Electricity- Production	UK Electricity	kWh	104	Form/Fill/Freeze	0.24143	25	0.3%
	Electricity- Production	UK Electricity	kWh	28,150	Freeze Drying	0.24143	6,796	76.2%
	Electricity- Production	UK Electricity	kWh	140	Sealing	0.24143	34	0.4%
	Electricity- Packaging	UK Electricity	kWh	366		0.24143	88	1.0%
Transportation	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.03	Buprenorphine HCL	1.72072	0.1	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	4.30	Purified Water	1.72072	7.4	0.1%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.04	Mannitol	1.72072	0.1	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	Aspartame	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Mint 51.296 Powder	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Citric Acid	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.17	Gel Nonox (Gelita)	1.72072	0.3	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.12	Corrugated Shipper	1.72072	0.2	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.12	Magazine	1.72072	0.2	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	2.67	Blister pack	1.72072	4.6	0.1%

	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden- WTT	miles	7.46	All deliveries	0.40710	3.0	0.0%
	Internal Transport	Rigid - (>8t) Average Laden	miles	8	Romford to Brentwood	1.59575	13	0.1%
	Internal Transport	Rigid - (>8t) Average Laden-wtt	miles	8	Romford to Brentwood	0.38231	3	0.0%
	Storage- Electricity		kWh	21	Cool Storage	0.24143	5	0.1%
	Downstream	HGV - (>33t) 100% Laden	miles	2.53	Ethypharm to client	1.72072	4	0.0%
	Downstream	HGV - (>33t) 100% Laden- WTT	miles	2.53	Ethypharm to client	0.40710	1	0.0%
Use	n/a							0.0%
End Of Life	Waste Disposal	Card	Kg	34.0	Corrugated Shipper	0.00469	0.2	0.0%
	Waste Disposal	Plastic	Kg	48.2	Magazine Card	0.00469	0.2	0.0%
	Waste Disposal	Film	Kg	109.5	Blister pack	0.00469	0.5	0.0%
	Waste Disposal	Foil	Kg	36.5	Blister pack	0.00469	0.2	0.0%
					Grand Total		8,917	

Appendix C –14348 EIRE MTD 1mg (Per Batch)

Life Cycle Stage	Classification	Category	Units	Quantity	Description	Emissions Factor	Carbon Emissions (kilograms CO2e)	Carbon Emissions %
Raw Materials	Material Use- Product	METHADONE HYDROCHLORIDE	Kg	2.00		240.00	480	8.0%
	Material Use- Product	LIQUID MALTITOL	Kg	1,152.00		2.36	2,719	45.3%
	Material Use- Product	Eurocert Green S	Kg	0.02		27.11	1	0.0%
	Material Use- Product	SUNSET YELLOW FCF	Kg	0.02		29.00	0	0.0%
	Material Use- Product	QUINOLENE YELLOW	Kg	0.16		29.00	5	0.1%
	Material Use- Product	SODIUM BENZOATE	Kg	2.40		1.79	4	0.1%
	Material Use- Product	HYDROCHLORIC ACID	Kg	1.10		0.53	1	0.0%
	Material Use- Product	Purified Water	Litres	2290.00		0.000399	1	0.0%
	Material Use- Packaging	HDPE	Kg	138.60	Bottles	3.0952	429	7.1%
	Material Use- Packaging	HDPE	Kg	134.43	Cap / Lid / Dropper	3.0952	416	6.9%
	Material Use- Packaging	Card	Kg	14.30	Carton - Non-Printed	1.1997	17	0.3%
	Material Use- Packaging	Card	Kg	0.04	Divider	1.1997	0	0.0%
	Material Use- Packaging	Paper	Kg	11.25	Label Printed	1.3451	15	0.2%
Production	Electricity- Production	UK Electricity	kWh	47.6	Manufacturing	0.24143	11	0.2%
	Electricity- Packaging	UK Electricity	kWh	68	Blister packs or filling	0.24143	16	0.3%
	Electricity- Packaging	UK Electricity	kWh	2	Labelling	0.24143	0	0.0%
Transportation	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	METHADONE HYDROCHLORIDE	1.72072	0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	7.40	LIQUID MALTITOL	1.72072	13	0.2%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	Eurocert Green S	1.72072	0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	SUNSET YELLOW FCF	1.72072	0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	QUINOLENE YELLOW	1.72072	0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	SODIUM BENZOATE	1.72072	0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	4.22	HYDROCHLORIC ACID	1.72072	7	0.1%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.76	Bottles	1.72072	1	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.26	Cap / Lid / Dropper	1.72072	0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Carton - Non-Printed	1.72072	0	0.0%

	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	Divider	1.72072	0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.07	Label Printed	1.72072	0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden- WTT	miles	12.74	WTT	0.40710	5	0.1%
	Internal Transport	Rigid - (>8t) Average Laden	miles	8	Romford to Brentwood	1.59575	13	0.2%
	Internal Transport	Rigid - (>8t) Average Laden-WTT	miles	8	Romford to Brentwood	0.38231	3	0.0%
	Storage- Electricity		kWh	21	Cool Storage	0.24143	5	0.1%
	Downstream	HGV - (>33t) 100% Laden	miles	4.9	Ethypharm to client	1.72072	8	0.1%
	Downstream	HGV - (>33t) 100% Laden- WTT	miles	4.9	Ethypharm to client	0.40710	2	0.0%
	Downstream	Freight Flight	Tonne.km	472	Ethypharm to client	1.27835	1,590	26.5%
	Downstream	Freight Flight	Tonne.km	472	Ethypharm to client	0.20515	239	4.0%
Use	n/a							0.0%
End Of Life	Waste Disposal	HDPE	Kg	138.60	Bottles	0.00469	0.6	0.0%
	Waste Disposal	HDPE	Kg	134.43	Cap / Lid / Dropper	0.00469	0.6	0.0%
	Waste Disposal	Card	Kg	14.30	Carton - Non-Printed	0.00469	0.1	0.0%
	Waste Disposal	Card	Kg	0.04	Divider	0.00469	0.0	0.0%
	Waste Disposal	Paper	Kg	11.25	Label Printed	0.00469	0.1	0.0%
					Grand Total		6,002	

Appendix D – 14413 MTD 1mg (Per Batch)

Life Cycle Stage	Classification	Category	Units	Quantity	Description	Emissions Factor	Carbon Emissions (kilograms CO2e)	Carbon Emissions %
Raw Materials	Material Use- Product	Liquid Refined Sugar	Kg	1,317.91		0.760	1,002	25.9%
	Material Use- Product	METHADONE HYDROCHLORIDE	Kg	2.00		240.00	480	12.4%
	Material Use- Product	Eurocert Green S	Kg	0.02		27.11	1	0.0%
	Material Use- Product	TARTRAZINE BPC	Kg	0.14		27.11	4	0.1%
	Material Use- Product	SUNSET YELLOW FCF	Kg	0.02		29.00	0	0.0%
	Material Use- Product	GLYCEROL	Kg	4.00		2.00	8	0.2%
	Material Use- Product	SODIUM BENZOATE	Kg	2.4000		1.79	1,494	38.7%
	Material Use- Product	HYDROCHLORIC ACID	Kg	1.20		0.53	0.6	0.0%
	Material Use- Product	PURIFIED WATER	Litres	2,319.00		0.0004	0.9	0.0%
	Material Use- Packaging	HDPE	Kg	138.60	Bottles	3.0952	429.0	11.1%
	Material Use- Packaging	HDPE	Kg	113.05	Cap / Lid / Dropper	3.0952	349.9	9.1%
	Material Use- Packaging	Card	Kg	14.30	Carton - Non-Printed	1.1997	17.2	0.4%
	Material Use- Packaging	Card	Kg	0.04	Divider	1.1997	0.0	0.0%
	Material Use- Packaging	Paper	Kg	12.50	Label Printed	1.3451	16.8	0.4%
Production	Electricity- Production	UK Electricity	kWh	24	Manufacturing	0.24143	6	0.2%
	Electricity- Packaging	UK Electricity	kWh	9.5	Blister packs or filling	0.24143	2	0.1%
	Electricity- Packaging	UK Electricity	kWh	0.9	Labelling	0.24143	0	0.0%
	Electricity- Packaging	UK Electricity	kWh	0.7	Shipment preparation	0.24143	0	0.0%
Transportation	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.58	Liquid Refined Sugar	1.72072	1.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	METHADONE HYDROCHLORIDE	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	Eurocert Green S	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	TARTRAZINE BPC	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	SUNSET YELLOW FCF	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	GLYCEROL	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	SODIUM BENZOATE	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	HYDROCHLORIC ACID	1.72072	0.0	0.0%

	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.76	Bottles	1.72072	1.3	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.22	Cap / Lid / Dropper	1.72072	0.4	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Carton - Non-Printed	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	Divider	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.08	Label Printed	1.72072	0.1	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden- WTT	miles	0.58	WTT	0.40710	0.7	0.0%
	Internal Transport	Rigid - (>8t) Average Laden	miles	8	Romford to Brentwood	1.59575	13	0.3%
	Internal Transport	Rigid - (>8t) Average Laden-WTT	miles	8	Romford to Brentwood	0.38231	3	0.1%
	Storage- Electricity		kWh	18	Cool Storage	0.24143	4	0.1%
	Downstream	HGV - (>33t) 100% Laden	miles	12.85	Ethypharm to client	1.72072	22	0.6%
	Downstream	HGV - (>33t) 100% Laden- WTT	miles	12.85	Ethypharm to client	0.40710	5	0.1%
Use	n/a							0.0%
End Of Life	Waste Disposal	HDPE	Kg	138.60	Bottles	0.00469	0.6	0.0%
	Waste Disposal	HDPE	Kg	113.05	Cap / Lid / Dropper	0.00469	0.5	0.0%
	Waste Disposal	Card	Kg	14.30	Carton - Non-Printed	0.00469	0.1	0.0%
	Waste Disposal	Card	Kg	0.04	Divider	0.00469	0.0	0.0%
	Waste Disposal	Paper	Kg	12.50	Label Printed	0.00469	0.1	0.0%
						Grand Total	3,864	

Appendix E – 14416 PHY 1mg (Per Batch)

Life Cycle Stage	Classification	Category	Units	Quantity	Description	Emissions Factor	Carbon Emissions (kilograms CO2e)	Carbon Emissions %
Raw Materials	Material Use- Product	METHADONE HYDROCHLORIDE	Kg	2.00		240.00	480	11.8%
	Material Use- Product	LIQUID MALTITOL	Kg	1,152.00		2.360	2,719	66.7%
	Material Use- Product	Eurocert Green S	Kg	0.02		27.110	1	0.0%
	Material Use- Product	SUNSET YELLOW FCF	Kg	0.02		29.000	0	0.0%
	Material Use- Product	QUINOLENE YELLOW	Kg	0.16		29.000	5	0.1%
	Material Use- Product	SODIUM BENZOATE	Kg	2.40		1.790	4	0.1%
	Material Use- Product	HYDROCHLORIC ACID	Kg	1.10		0.529	1	0.0%
	Material Use- Product	PURIFIED WATER	Litres	2,290.00		0.0004	0.9	0.0%
	Material Use- Packaging	HDPE	Kg	138.60	Bottles	3.0952	429.0	10.5%
	Material Use- Packaging	HDPE	Kg	113.05	Cap / Lid / Dropper	3.0952	349.9	8.6%
	Material Use- Packaging	Card	Kg	5.78	Label Printed	1.3451	7.8	0.2%
	Material Use- Packaging	Paper	Kg	14.30	Carton - Printed	1.1997	17.2	0.4%
	Material Use- Packaging	Card	Kg	0.04	Divider	1.1997	0.0	0.0%
Production	Electricity- Production	UK Electricity	kWh	24.0	Manufacturing	0.24143	6	0.1%
	Electricity- Packaging	UK Electricity	kWh	11.4	Blister packs or filling	0.24143	3	0.1%
	Electricity- Packaging	UK Electricity	kWh	1.0	Labelling	0.24143	0	0.0%
	Electricity- Packaging	UK Electricity	kWh	0.8	Shipment preparation	0.24143	0	0.0%
Transportation	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	METHADONE HYDROCHLORIDE	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	7.40	LIQUID MALTITOL	1.72072	12.7	0.3%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	Eurocert Green S	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	SUNSET YELLOW FCF	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	QUINOLENE YELLOW	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	SODIUM BENZOATE	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	HYDROCHLORIC ACID	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.76	Bottles	1.72072	1.3	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.22	Cap / Lid / Dropper	1.72072	0.4	0.0%

	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.04	Label Printed	1.72072	0.1	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Carton - Printed	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	Divider	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden- WTT	miles	8.45	WTT	0.40710	3.4	0.1%
	Internal Transport	Rigid - (>8t) Average Laden	miles	8	Romford to Brentwood	1.59575	13	0.3%
	Internal Transport	Rigid - (>8t) Average Laden-WTT	miles	8	Romford to Brentwood	0.38231	3	0.1%
	Storage- Electricity		kWh	18	Cool Storage	0.24143	4	0.1%
	Downstream	HGV - (>33t) 100% Laden	miles	7.3	Ethypharm to client	1.72072	13	0.3%
	Downstream	HGV - (>33t) 100% Laden- WTT	miles	7.3	Ethypharm to client	0.40710	3	0.1%
Use	n/a							0.0%
End Of Life	Waste Disposal	HDPE	Kg	138.60	Bottles	0.00469	0.6	0.0%
	Waste Disposal	HDPE	Kg	113.05	Cap / Lid / Dropper	0.00469	0.5	0.0%
	Waste Disposal	Paper	Kg	5.78	Label Printed	0.00469	0.0	0.0%
	Waste Disposal	Card	Kg	14.30	Carton - Printed	0.00469	0.1	0.0%
	Waste Disposal	Card	Kg	0.04	Divider	0.00469	0.0	0.0%
						Grand Total	4,079	

Appendix F – 14824 Morphine 10mg (Per Batch)

Life Cycle Stage	Classification	Category	Units	Quantity	Description	Emissions Factor	Carbon Emissions (kilograms CO2e)	Carbon Emissions %
Raw Materials	Material Use- Product	MORPHINE SULFATE	Kg	4.00		240.000	960	5.9%
	Material Use- Product	SODIUM METHYLHYDROXYBENZOATE	Kg	4.00		2.590	10	0.1%
	Material Use- Product	SODIUM PROPYLHYDROXYBENZOATE	Kg	0.50		2.590	1	0.0%
	Material Use- Product	SUCROSE	Kg	900.00		0.700	630	3.9%
	Material Use- Product	RASPBERRY FLAVOUR NA	Kg	0.20		25.000	5	0.0%
	Material Use- Product	TITRIPLEX III DISODIUM EDETATE	Kg	0.10		1.320	0	0.0%
	Material Use- Product	HYDROCHLORIC ACID	Kg	2.25		0.529	1	0.0%
	Material Use- Product	ETHANOL	Kg	126.6		0.95	120	0.7%
	Material Use- Product	PURIFIED WATER	Litres	2,320		0.0004	1	0.0%
	Material Use- Packaging	HDPE	Kg	233.80	Bottles	3.0952	723.6	4.5%
	Material Use- Packaging	HDPE	Kg	158.27	Cap / Lid / Dropper	3.0952	489.9	3.0%
	Material Use- Packaging	Card	Kg	23.84	Carton - Non-Printed	1.1997	28.6	0.2%
	Material Use- Packaging	Card	Kg	309.87	Carton - Printed	1.1997	371.8	2.3%
	Material Use- Packaging	Paper	Kg	25.00	Label Printed	1.3451	33.6	0.2%
	Material Use- Packaging	Paper	Kg	8.50	Leaflet / Booklets	1.3451	11.4	0.1%
Production	Electricity- Production	UK Electricity	kWh	95.2	Manufacturing	0.24143	23	0.1%
	Electricity- Packaging	UK Electricity	kWh	272.0	Blister packs or filling	0.24143	66	0.4%
	Electricity- Packaging	UK Electricity	kWh	8.0	Labelling	0.24143	2	0.0%
	Electricity- Packaging	UK Electricity	kWh	166.4	Boxing	0.24143	40	0.2%
Transportation	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.02	MORPHINE SULFATE (SIEGFRIED)	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	SODIUM METHYLHYDROXYBENZOATE	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	SODIUM PROPYLHYDROXYBENZOATE	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.40	SUCROSE	1.72072	0.7	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	RASPBERRY FLAVOUR NA	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	TITRIPLEX III DISODIUM EDETATE (EDTA)	1.72072	0.0	0.0%

	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	HYDROCHLORIC ACID	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.08	ETHANOL BP (DUTY FREE) ABSOLUTE ALCOHOL	1.72072	0.1	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.45	Bottles	1.72072	0.8	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.31	Cap / Lid / Dropper	1.72072	0.5	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.02	Carton - Non-Printed	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	1.92	Carton - Printed	1.72072	3.3	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.15	Label Printed	1.72072	0.3	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Leaflet / Booklets	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden- WTT	miles	3.38	WTT	0.40710	1.4	0.0%
	Internal Transport	Rigid - (>8t) Average Laden	miles	8	Romford to Brentwood	1.59575	13	0.1%
	Internal Transport	Rigid - (>8t) Average Laden	miles	8	Romford to Brentwood	0.38231	3	0.0%
	Storage- Electricity		kWh	25	Cool Storage	0.24143	6	0.0%
	Downstream	HGV - (>33t) 100% Laden	miles	11.6	Ethypharm to client	1.72072	20	0.1%
	Downstream	HGV - (>33t) 100% Laden- WTT	miles	11.6	Ethypharm to client	0.40710	5	0.0%
	Downstream	Freight Flight	Tonne.km	12,255	Ethypharm to client	1.27835	11,022	67.8%
	Downstream	Freight Flight	Tonne.km	12,255	Ethypharm to client	0.20515	1,656	10.2%
Use	n/a							0.0%
End Of Life	Waste Disposal	HDPE	Kg	233.80	Bottles	0.00469	1.1	0.0%
	Waste Disposal	HDPE	Kg	158.27	Cap / Lid / Dropper	0.00469	0.7	0.0%
	Waste Disposal	Paper	Kg	23.84	Carton - Non-Printed	0.00469	0.1	0.0%
	Waste Disposal	Card	Kg	309.87	Carton - Printed	0.00469	1.5	0.0%
	Waste Disposal	Paper	Kg	25.00	Label Printed	0.00469	0.1	0.0%
	Waste Disposal	Paper	Kg	8.50	Leaflet / Booklets	0.00469	0.0	0.0%
						Grand Total	**16,254**	

Appendix G – 15001 Adrenaline 10mg (Per Batch)

Life Cycle Stage	Classification	Category	Units	Quantity	Description	Emissions Factor	Carbon Emissions (kilograms CO2e)	Carbon Emissions %
Raw Materials	Material Use- Product	Adrenaline Tartrate	Kg	0.04		6.15	0.2	0.0%
	Material Use- Product	SODIUM METABISULPHITE	Kg	0.20		2.59	0.5	0.0%
	Material Use- Product	Sodium chloride BP USP Ph Eur	Kg	1.20		0.22	0.3	0.0%
	Material Use- Product	CITRIC ACID MONOHYD	Kg	0.32		2.44	0.8	0.0%
	Material Use- Product	SODIUM CITRATE BP POWDER	Kg	0.08		22.20	1.8	0.0%
	Material Use- Product	HYDROCHLORIC ACID BP/EP/USNF Emprove	Kg	0.12		0.529	0.1	0.0%
	Material Use- Packaging	HDPE	Kg	535.50	Cap / Lid / Dropper	3.0952	1657.5	10.5%
	Material Use- Packaging	Paper	Kg	28.91	Label Printed	1.1997	38.9	0.2%
	Material Use- Packaging	HDPE	Kg	1,020.00	Plastic Container	3.0952	3157.1	20.0%
	Material Use- Packaging	Paper	Kg	24.28	Leaflet / Booklets	1.1997	32.7	0.2%
	Material Use- Packaging	Paper	Kg	28.91	Label Printed	1.1997	38.9	0.2%
	Material Use- Packaging	Paper	Kg	28.91	Label Printed	1.1997	38.9	0.2%
	Material Use- Packaging	Card	Kg	11.70	Carton - Non-Printed	1.3451	14.0	0.1%
Production	Electricity- Production	UK Electricity	kWh	0.8	Manufacturing	0.24143	0	0.0%
	Electricity- Packaging	UK Electricity	kWh	1.3	Blister packs or filling	0.24143	0	0.0%
	Electricity- Packaging	UK Electricity	kWh	196.0	Labelling	0.24143	47	0.3%
	Electricity- Packaging	UK Electricity	kWh	91.0	Boxing	0.24143	22	0.1%
Transportation	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	Adrenaline Tartrate (PFS)	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	SODIUM METABISULPHITE	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Sodium chloride	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	CITRIC ACID MONOHYD	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	SODIUM CITRATE BP POWDER	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00	HYDROCHLORIC ACID BP/EP/USNF Emprove PFS	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	1.88	Cap / Lid / Dropper	1.72072	3.2	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.18	Label Printed	1.72072	0.3	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	3.89	Plastic Container	1.72072	6.7	0.0%

	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.03	Leaflet / Booklets	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.18	Label Printed	1.72072	0.3	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.18	Label Printed	1.72072	0.3	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Carton - Non-Printed	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden- WTT	miles	6.36	WTT	0.40710	2.6	0.0%
	Internal Transport	Rigid - (>8t) Average Laden	miles	8	Romford to Brentwood	1.59575	13	0.1%
	Internal Transport	Rigid - (>8t) Average Laden-WTT	miles	8	Romford to Brentwood	0.38231	3	0.0%
	Storage- Electricity		kWh	21	Cool Storage	0.24143	5	0.0%
	Downstream	HGV - (>33t) 100% Laden	miles	12.4	Ethypharm to client	1.72072	21	0.1%
	Downstream	HGV - (>33t) 100% Laden- WTT	miles	12.4	Ethypharm to client	0.40710	5	0.0%
	Downstream	Freight Flight	Tonne.km	10,281	Ethypharm to client	1.27835	9,247	58.7%
	Downstream	Freight Flight	Tonne.km	10,281	Ethypharm to client	0.20515	1,390	8.8%
Use	n/a							0.0%
End Of Life	Waste Disposal	HDPE	Kg	535.5	Cap / Lid / Dropper	0.00469	2.5	0.0%
	Waste Disposal	Paper	Kg	28.90625	Label Printed	0.00469	0.1	0.0%
	Waste Disposal	HDPE	Kg	1020	Plastic Container	0.00469	4.8	0.0%
	Waste Disposal	Paper	Kg	24.28125	Leaflet / Booklets	0.00469	0.1	0.0%
	Waste Disposal	Paper	Kg	28.90625	Label Printed	0.00469	0.1	0.0%
	Waste Disposal	Paper	Kg	28.90625	Label Printed	0.00469	0.1	0.0%
	Waste Disposal	Card	Kg	11.70153	Carton - Non-Printed	0.00469	0.1	0.0%
					Grand Total		**15,756**	

Appendix H – 17863 Fentanyl 2mg (Per Batch)

Life Cycle Stage	Classification	Category	Units	Quantity	Description	Emissions Factor	Carbon Emissions (kilograms CO2e)	Carbon Emissions %
Raw Materials	Material Use- Product	FENTANYL CITRATE	Kg	0.03		240.00	7.5	0.1%
	Material Use- Product	SODIUM CHLORIDE	Kg	3.60		0.22	0.8	0.0%
	Material Use- Packaging	Card	Kg	231.25	Label Printed	1.1997	311.0	2.3%
	Material Use- Packaging	Card	Kg	832.11	Carton - Printed	1.3451	998.3	7.5%
	Material Use- Packaging	Paper	Kg	22.20	Leaflet / Booklets	1.1997	29.9	0.2%
	Material Use- Packaging	Card	Kg	7.71	Carton - Non-Printed	1.3451	9.3	0.1%
Production	Electricity- Production	UK Electricity	kWh	1.6	Manufacturing	0.24143	0	0.0%
	Electricity- Production	UK Electricity	kWh	117.3	Filling	0.24143	28	0.2%
	Electricity- Production	UK Electricity	kWh	100.0	Inspection	0.24143	24	0.2%
	Electricity- Packaging	UK Electricity	kWh	924.0	Blister packs or filling	0.24143	223	1.7%
	Electricity- Packaging	UK Electricity	kWh	64.0	Labelling	0.24143	15	0.1%
	Electricity- Packaging	UK Electricity	kWh	271.6	Boxing	0.24143	66	0.5%
	Electricity- Packaging	UK Electricity	kWh	106.4	Shipment preparation	0.24143	26	0.2%
Transportation	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.00		1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.02		1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	1.43	Label Printed	1.72072	2.5	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	5.14	Carton - Printed	1.72072	8.9	0.1%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.03	Leaflet / Booklets	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden	miles	0.01	Carton - Non-Printed	1.72072	0.0	0.0%
	Upstream (Supplier to Ethypharm)	HGV - (>33t) 100% Laden- WTT	miles	6.62	WTT	0.40710	2.7	0.0%
	Internal Transport	Rigid - (>8t) Average Laden	miles	8	Romford to Brentwood	1.59575	13	0.1%
	Internal Transport	Rigid - (>8t) Average Laden	miles	8	Romford to Brentwood	0.38231	3	0.0%
	Storage- Electricity		kWh	21	Cool Storage	0.24143	5	0.0%
	Downstream	HGV - (>33t) 100% Laden	miles	2.2	Ethypharm to client	1.72072	4	0.0%

	Downstream	HGV - (>33t) 100% Laden- WTT	miles	2.2	Ethypharm to client	0.40710	1	0.0%
	Downstream	Freight Flight	Tonne.km	11,153	Ethypharm to client	1.27835	10,031	75.3%
	Downstream	Freight Flight	Tonne.km	11,153	Ethypharm to client	0.20515	1,507	11.3%
Use	n/a							0.0%
End Of Life	Waste Disposal	Paper	Kg	231.25	Label Printed	0.00469	1.1	0.0%
	Waste Disposal	Card	Kg	832.11	Carton - Printed	0.00469	3.9	0.0%
	Waste Disposal	Paper	Kg	22.20	Leaflet / Booklets	0.00469	0.1	0.0%
	Waste Disposal	Card	Kg	7.71	Carton - Non-Printed	0.00469	0.0	0.0%
					Grand Total		**13,323**	

Appendix I – Emissions Factors References

Material	Reference
ADRENALINE TARTRATE	Amino acids - Europe · 6.15 kg CO_2e/kg | Verified by CarbonCloud
ASPARTAME	Environmental life cycle assessment of production of the non-nutritive sweeteners aspartame (E951) and neotame (E961) from chemical processes: The SWEET project
BUPRENORPHINE HCL	The Environmental footprint of morphine: a life cycle assessment from opium poppy farming to the packaged drug
CITRIC ACID	EcoInvent- Citric Acid, Product production, Europe
ETHANOL BP (DUTY FREE) ABSOLUTE ALCOHOL	Ethanol · 0.95 kg CO_2e/kg | Verified by CarbonCloud
EUROCERT GREEN S (FOOD DYE)	E100-E199 - Colors (coloring agents) · 27.11 kg CO_2e/kg | Verified by CarbonCloud
Gel Nonox EP/USNF/JP (Gelita)	Gelatine.org Carbon Footprint of Gelatine and Collagen Peptides
GLYCEROL	Glycerol. E422 · 2.00 kg CO_2e/kg | Verified by CarbonCloud
HYDROCHLORIC ACID	EcoInvent- Hydrochloric Acid, Product Production, Europe
LIQUID MALTITOL	Fructose · 2.36 kg CO_2e/kg | Verified by CarbonCloud
LIQUID REFINED SUGAR	Category: Sugars and sugar confectionery · 0.76 kg CO_2e/kg | Verified by CarbonCloud
METHADONE HYDROCHLORIDE BP	The Environmental footprint of morphine: a life cycle assessment from opium poppy farming to the packaged drug
Mint 51.296 Powder	EcoInvent- Mint, Product production, Global
MORPHINE SULFATE BP (SIEGFRIED)	The Environmental footprint of morphine: a life cycle assessment from opium poppy farming to the packaged drug
QUINOLENE YELLOW (Food dye)	Natural coloring, yellow · 29.04 kg CO_2e/kg | Verified by CarbonCloud
RASPBERRY FLAVOUR	Synthetic food flavoring, generic · 25.00 kg CO_2e/kg | Verified by CarbonCloud
SODIUM BENZOATE	market for benzoic acid - Europe - benzoic acid | ecoQuery
SODIUM CHLORIDE	Table salt · 0.22 kg CO_2e/kg | Verified by CarbonCloud
SODIUM CITRATE BP POWDER	Sodium citrate. E331 · 22.22 kg CO_2e/kg | Verified by CarbonCloud
SODIUM METABISULPHITE	E200-E299 - Preservatives · 2.59 kg CO_2e/kg | Verified by CarbonCloud
SODIUM METHYLHYDROXYBENZOATE	E200-E299 - Preservatives · 2.59 kg CO_2e/kg | Verified by CarbonCloud
SODIUM PROPYLHYDROXYBENZOATE	E200-E299 - Preservatives · 2.59 kg CO_2e/kg | Verified by CarbonCloud
SUCROSE	Beet sugar (Sucrose) · 0.70 kg CO_2e/kg | Verified by CarbonCloud
SUNSET YELLOW FCF	Natural coloring, yellow · 29.04 kg CO_2e/kg | Verified by CarbonCloud

SUNSET YELLOW FCF (Food dye)	Natural coloring, yellow · 29.04 kg CO_2e/kg | Verified by CarbonCloud
TARTRAZINE BPC	E100-E199 - Colors (coloring agents) · 27.11 kg CO_2e/kg | Verified by CarbonCloud
TITRIPLEX III DISODIUM EDETATE (EDTA)	EcoInvent-Disodium Disulfate Production, Product Production, Europe

Appendix J – LCA Process Flow with Emissions Sources and Data Requirements