METROLINK

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A5.7

Construction Vehicles, Plant & Equipment

Contents

1. Introduction

This report contains information on the anticipated type and number of construction vehicle movements required during the construction phase of the proposed Project. The charts contained in Appendix B show the calculated average construction vehicle movement numbers per day at the construction sites for the duration of the relevant construction period.

1.1 Important Notes

- The vehicle numbers chart for each construction site shows ‘movements’ (not ‘vehicles’). Each vehicle visiting site has two movements: one in and one out.
- The project construction programme calculates activity durations in hours which often means that a single day has two sequential activities taking place. This can lead to single-day spikes in the data where effectively, twice the number of movements are shown.
- The charts show average numbers. The calculation takes the total number of lorries to service each programme activity and divides this by the activity duration in ‘delivery days’. Some activities will require more deliveries at the start of the activity (for example placing rebar). Other activities will require more deliveries near the end of the activity (e.g. a concrete pour will have most deliveries on the day of the pour). Therefore, the peak movement numbers per day may be considerably higher than the average numbers shown.
- These calculations are based on unconstrained project-wide resource levels.

1.2 Exclusions

Vehicle numbers and material volumes have not been included for the following:

- Construction volumes for Dardistown Depot to main route connection;
- Flood mitigation or compensation works;
- Additional ground investigation or any other investigations;
- Settlement mitigation works;
- Utility diversions; and
- Works to remove or remediate contaminated land and invasive species.

2. Report Information

2.1 Production Rates

The excavation and activity rates utilised are in line with the Basis of Construction Phase Programme.

2.2 Travel Routes

This report makes no assumptions as to the:

- Source of plant, materials delivered to site;
- Destination of plant, materials, or waste taken off site; and
- The route of travel.

Construction vehicle travel routes are detailed in the Scheme Traffic Management Plan (Appendix 9.4, Volume 5 of this EIAR).

2.3 Vehicle Types

- Heavy Goods Vehicles (HGVs) are split into tippers, flatbeds, concrete trucks and low loaders;
- Light Goods Vehicles (LGVs) have been included based on a percentage of HGVs for each site;
- Small vans are not included; and
- Private cars are assumed to be excluded from the majority of sites.

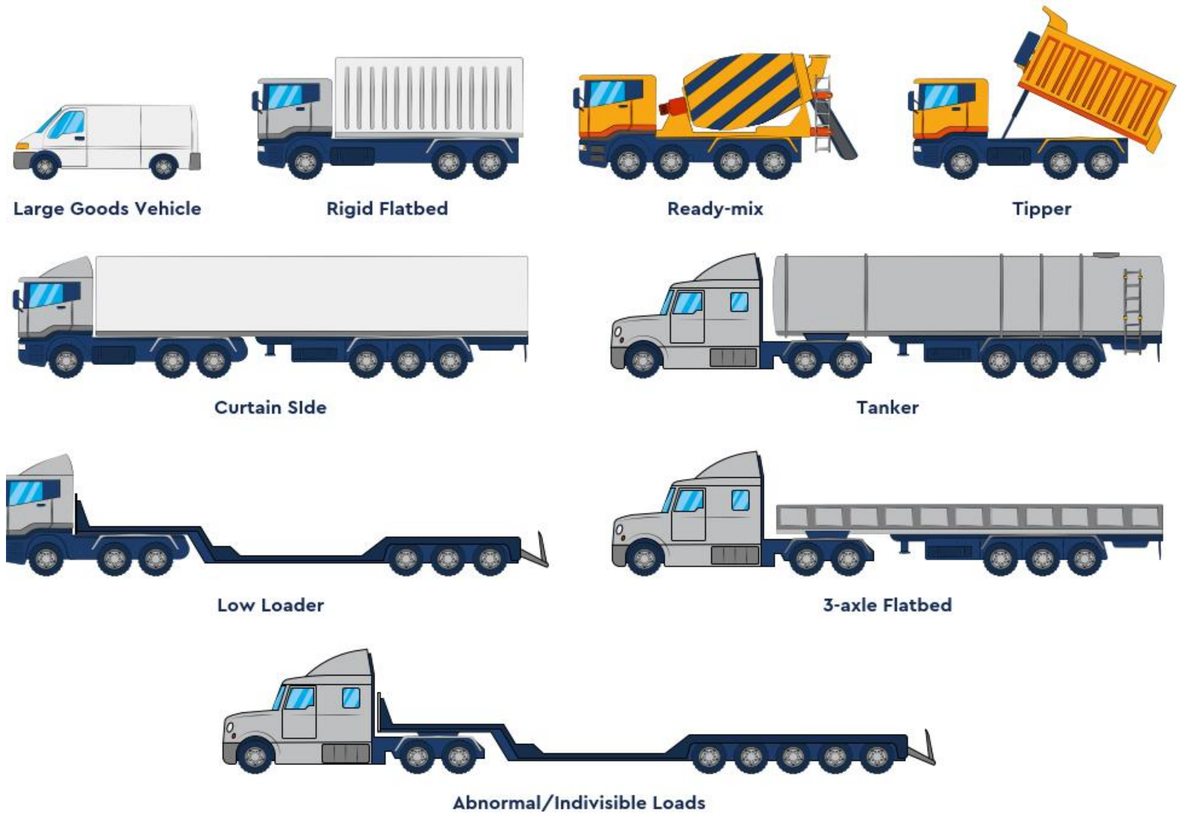


Figure 2-1 Construction Vehicle Types

2.4 Logistics Sites

Where materials are supplied to a logistics site and then moved on to the final destination, this has been included as four movements (or journeys):

- Supplier vehicle entering logistics site to deliver;
- Supplier vehicle leaving logistics site (generally empty);
- Logistics vehicle delivering to construction site; and
- Logistics vehicle returning to logistics site.

If the number of vehicles passing through gates was counted, the above would be counted as six, as both the third and fourth journeys each pass through two site gates.

2.5 Abnormal Loads

- Abnormal loads will include large, heavy sections of the tunnel boring machines (TBMs), gantry crane beams over 20m, diaphragm wall hydro-fraises, piling plant and silos.
- Their estimated numbers are included within the abnormal load/special vehicle table on each report page.
- The movements of these vehicles are not included within the vehicle movement charts.

2.6 Vehicle Movement Considerations

- In order to provide an estimated peak number of movements, the total movements from the day with the highest combined movements has been used, plus an additional 20%.
- To give an estimated number of LGVs, 10% of the total calculated movements has been used.
- In the movements chart, narrow peaks can occur due to two adjacent activities overlapping by a single day (end date = start date), therefore both activities produce movements for the same date, when in reality, it is more likely that the follow-on activity starts the day after the previous activity ends.

Appendix A – Assumptions

A.1 Material Capacity Assumptions

Site Establishment:

- Demolition/level site = 20 tippers per day (where no volume has been provided)
- Dewatering assumed equipment for four wells per 24t flatbed
- Fencing worksites: It is assumed that boards of 18mm thick plywood of dimensions 1.2m x 2.4m (length x height), weighing 43kg per board, will be used for worksite hoarding.
- Topsoil strip 'Soft' quantity = 0.3 x site area (site areas measured using the maximum site boundaries determined from site boundary CAD drawings).
- Haul roads quantified as 0.15 x site area for granular fill and 0.15 x site area for concrete.
- Tree volumes estimated as 1m3 per tree (except for central section where vegetation volume is estimated by planner). Approximate tree counts taken from site survey layouts.

Diaphragm Walls:

- Bentonite plants are sized to provide enough support fluid for the excavation of two + one extra panels per day for diaphragm walls at a concentration of 40kg of bentonite per 1m3 of water.
- Assumed each panel excavated is 135m3 in volume (1.2m x 3m x 37.5m (W x L x D)), resulting in 135 x 40kg = 5,400kg. Rounded up to 5,500kg (5t) of Bentonite per panel. Based on having three panels worth of Bentonite, this comes to 16.5t per site where required.
- As Bentonite will need replenishing over time, the additional occasional deliveries of fresh Bentonite are catered for within the vehicles for general deliveries to site.
- A Bentonite plant's set up assumed to require six special vehicles and four HGVs.
- It is assumed that bentonite storage containers are leak-proof.

Construction:

- Struts for shafts and portal excavations: one every 7 - 10m
- For falsework, assuming ALUMASTER 60 KN/m2, with a weight of 28 kg/m2 (under shuttering)
- Scaffold (currently under shuttering) at 200kg/m3
- Platforms (assumed precast elements 1m sections, approximately 7.2 tonnes each) @ two per vehicle.
- MEP fit out works to systemwide assets & cabling (Radio, SCADA, DOO, etc), estimated at two flatbeds and two curtain side vehicles per day of activity.
- For internal walls only the larger block with dimensions 400mm x 200mm x 200mm (length x width x height) has been used for calculations. 75 blocks (6m2) per pallet, 12 pallets/vehicle = 72m2 per vehicle

TBM/Tunnelling:

- TBM conveyor belt supplied in 400m lengths (covering 200m of tunnel each). Two rolls of 400m per vehicle.
- Tunnel excavation: 9.5m outside diameter, for now assuming all rock for Dublin Airport Station, and 60% rock and 40% soft for the south drive. (Based on TBM CR) .
- Number of segments per ring: 10
- Unit weight of annulus grout: 1,800kg/m3
- The formation of an ideal filter cake for TBM slurry is also assumed, therefore no slurry loss occurs at face excavation.
- Temporary cable and pipe brackets, calculated at 2.5kg per metre of 316 stainless steel.
    - Each bracket containing 5.2m of steel, therefore 13kg. Outer dimensions lying flat are 1.7m(l) x 0.6m(d) x 0.05m(h).
    - Flatbed dimension capacity = estimate 21 per layer.
    - Flatbed usable height (2.2m), therefore number of layers: 2.2m/(0.05m(h) x 1.05m(added tolerance)) = 46
    - Therefore, number of brackets per flatbed (FB) = 966
    - Brackets required for main tunnel estimated = 3,178 (length of main tunnel 9,535/3)
    - Flatbeds = 3,178/966 = four (rounded up)
    - Brackets required for airport tunnel estimated = 800 (length of main tunnel 2,400/3)
    - Flatbeds = 800/861 = one (rounded up)
- Conveyor belt steel structure weight: 200kg/ring (c-section steel bars are used, and it includes extra for bridges and belt storage cassettes).
- Temporary service cables: Assumed six cables (4 x 100m drum per vehicle).
- Temporary service pipes estimated at 6 inches in diameter and 6m long, giving 100 segments per vehicle.
- Tunnel clearance calculated as (7.88m2 (invert area) x tunnel section length).

Track Bed:

- First stage concrete comprises the following ratios for the final concrete volume:
    - 0.171 x cement
    - 0.256 x fine aggregate
    - 0.513 x coarse aggregate

  - 0.06 x water (no vehicles have been counted for water delivery as it is assumed the water will be supplied via mains on site)

- Second stage concrete comprises the following ratios for the final concrete volume:
  - 0.13 x cement
  - 0.72 x aggregate
  - 0.15 x water (no vehicles have been counted for water delivery as it is assumed the water will be supplied via mains on site)

- Second stage track bed concrete volumes have been calculated by measuring the cross-sectional areas within the Cross Section and Alignment document, multiplied by the section lengths. As the measurements have been produced by using the PDF measuring tool (cross-sections) and by scaling of print-outs (alignment lengths), the resulting volumes cannot be taken as 100% accurate.

- Quantity of reinforcement for track slab. [120kg/m3]

Track:

- Track segment = 12m length, 54.77kg each, based on type: 54E1 = 36 per vehicle.
- Sleepers = 19 per track segment, 70kg each, type TBZB Sp (same weight for wooden sleepers in overruns).
- Track fastener sets = 19 per track segment, estimated 10kg per set, type Vossloh 300.
- For rail scissor type crossovers, a total rails length of 157.2m is assumed.
- For the railyard tracks, ballast will be laid to a depth of 450mm following UK railway specifications for industrial use.
- Duration for removal of railheads is taken as 125 days. Beginning at the last day of track laying activities.

Groundwater disposal:

- The disposal of water requirement ceases upon the completion of the base slab strength gain, with the assumption that the base slab can withstand the uplift pressures from the hydrostatic head.
- The volume of water requiring disposal has been calculated by assuming an inflow of 0.5l/second, resulting in 43,200 litres per 24 hours.
- The rigid body tankers have an assumed capacity of 20,000 litres, resulting in 3 additional vehicles (6 movements) per day during the groundwater disposal period.

A.2 Estuary Park and Ride Assumptions

Using https://www.calculator.net/concrete-calculator.html and https://www.yourspreadsheets.co.uk/reinforcement-estimates.html

Precast Stairs and Landings:

- Estimated that each precast stair section = 1.3 tonne concrete + 130kg rebar = 1.5 tonnes (rounded up).
- Estimated that each precast landing section (assumed dimensions 3 x 1.5 x 0.2m) = 2 tonnes + 130kg rebar = 2.2 tonnes (rounded up).
- Each set = 3.7 tonnes; round up to four tonnes.
- Each flatbed (24t capacity) can transport six sets of one stair and one landing.

Columns:

- Assumed column dimensions: 4 x 0.5 x 0.5m
- Concrete = 2.13 tonnes, rebar = 300kg (total 2.43 tonnes rounded up to 2.5 tonnes)
- Each column = 2.5 tonne
- Each flatbed (24t capacity) can transport nine columns

Beams:

- Assumed column dimensions: 8 x 0.5 x 0.5m
- Concrete = 4.26 tonnes, rebar = 200kg (total 4.46 tonnes rounded up to 5 tonnes)
- Each beam = 5 tonne
- Each flatbed (24t capacity) can transport four beams.

Wall Panels:

- Assumed dimensions: 8 x 1.5 x 0.2m
- Concrete = 5.12 tonnes, rebar = 100kg (total 5.22 tonnes rounded up to 5.5 tonnes)
- Each panel = 5.5 tonne
- Each flatbed (24t capacity) can transport four panels.

Floor Units:

- Assumed dimensions: 12 x 2 x 0.3m
- Concrete = 15.34 tonnes, rebar = 120kg (total 15.46 tonnes rounded up to 15.5 tonnes)

- Each panel = 15.5 tonne
- Each flatbed (24t capacity) can transport one unit.

Cladding:

- Assumed dimensions: 2 x 1 x 0.015m
- Glass = 75kg per panel
- Each flatbed (24,000kg capacity) can transport 320 panels, but to consider glass packing and spacing, assume a trailer is stacked five rows of 20 panels, so 100 panels per flatbed.

A.3 Broad Meadow Viaduct

Retaining Wall:

- Approximately 150m long.
- Panels: 3.5 x 1.5 x 0.2m
- Concrete = 2.24 tonnes, rebar = 150kg (total 2.39 tonnes rounded up to 2.5 tonnes)
- Each wall panel = 2.5 tonnes
- Each flatbed (24t capacity) can transport nine panels.
- Wall required 43 panels.

Piers:

- Used M50 volumes of 95m3 per six piles (per pier), total 13 piers = 1,235m3
- Reinforcement @85kg/m3

Abutment:

- Used same as M50 Abutment soft excavation plus 190m3 for pile excavation (same volume as M50)
- Concrete for piles = 190m3
- Reinforcement @85 kg/m3

Deck info:

- PCC beams at 20 x 1 x 1m = 20m3
- Transported by abnormal load
- Total beams at 13 (spans) x eight (per span) = 104
- In-situ concrete calculated at 320 x 10 x 0.5m = 1,600m3
- Reinforcement @185kg/m3

A.4 Dardistown Depot

Roof Cladding:

(https://www.foregale.co.uk/wp-content/uploads/2019/11/FORECLAD-200-F200R.pdf)

Assumption as follows:

- 0.7mm thickness @ 6.7kg per linear metre
- Panel: 1 x 14m (14m2) = 93.8kg
- Flatbed can carry two panels per layer = 187.6kg per layer
- Flatbed weight capacity = 24,000kg
- 24,000/187.6 = 127.9 layers
- Each layer = 0.7mm
- 127.9 x 0.7 = 89.53mm plus the initial 31mm height = 120.53mm which is well within flatbed height allowance.
- Assumed 126 panels per flatbed.

Wall Cladding:

(https://www.foregale.co.uk/wp-content/uploads/2019/11/FORECLAD-200-F200R.pdf)

Assumption as follows:

- 0.7mm thickness @ 6.7kg per linear metre
- Panel: 1 x 5m (14m2) = 33.5kg
- Flatbed can carry four panels per layer = 134kg per layer
- Flatbed weight capacity = 24,000kg
- 24,000/134 = 179 layers
- Each layer = 0.7mm
- 179 x 0.7 = 125mm plus the initial 31mm height = 156mm which is well within flatbed height allowance.
- Assumed 179 panels per flatbed.

A.5 M50 Bridge

Sheet Piles:

- Assumed flatbed capacity of 60 sections (5m length)
- Information reference: https://slideplayer.com/slide/14229672/ (slide 13; AU14))

Pre-welded Steel Beam sections:

- Assumed 10m sections and one per flatbed.

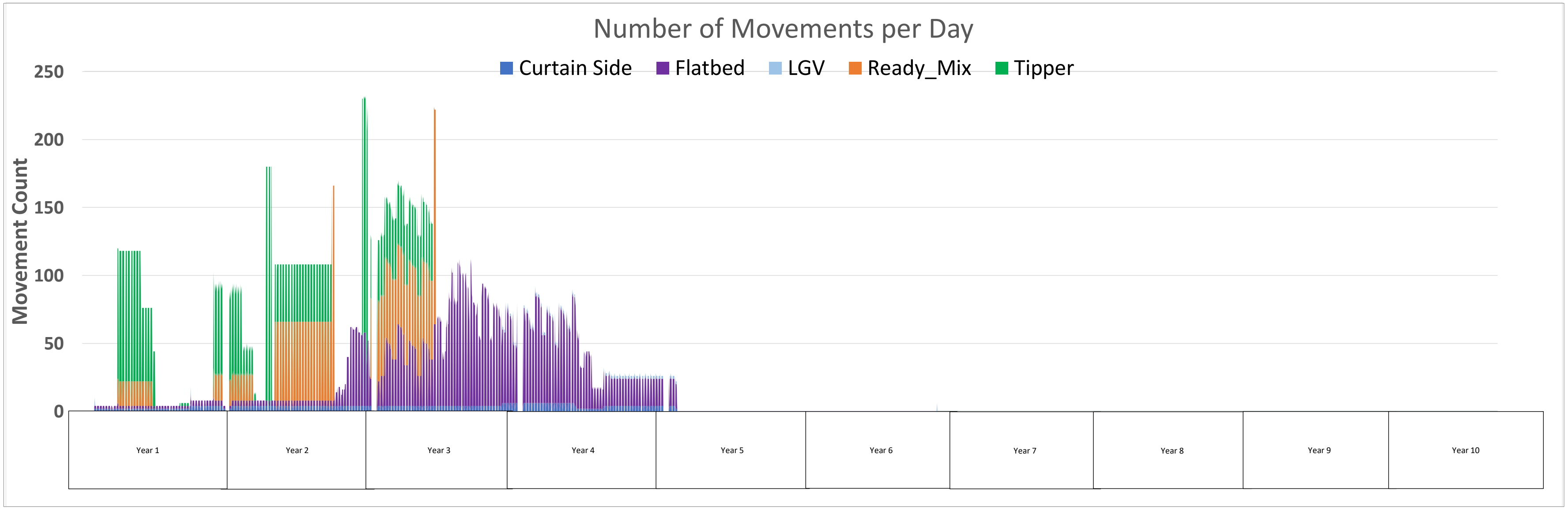
GRP Formwork:

Ref: http://www.emjplastics.com/assets/files/permadec-technical-literature-1.pdf

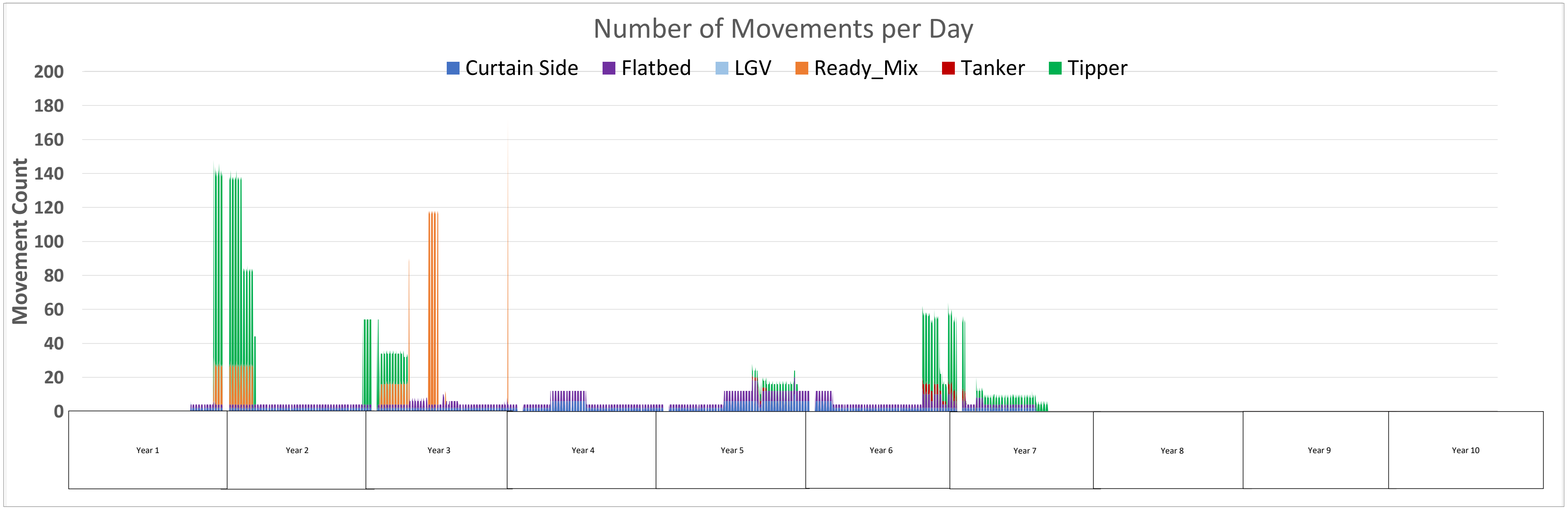
- Assumed product: 5C
- Assumed quantity per flatbed = 120 panels @ approximately 11 tonnes

Appendix B – Construction Vehicle Movements Charts

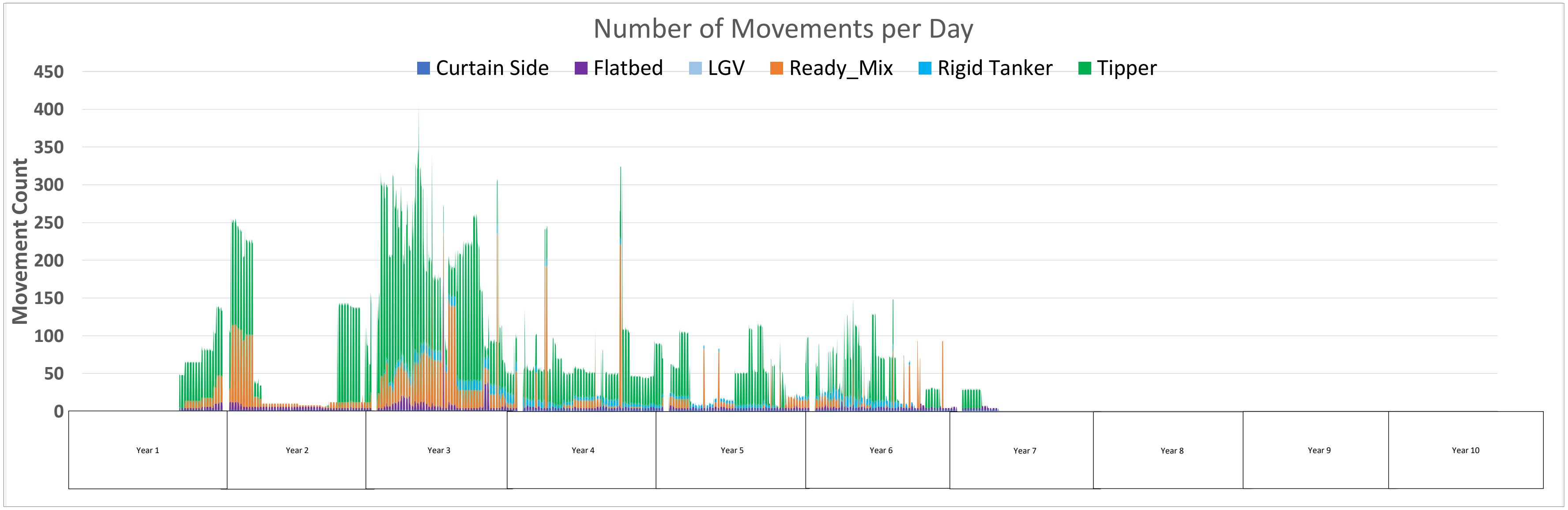
Estuary Park and Ride Section



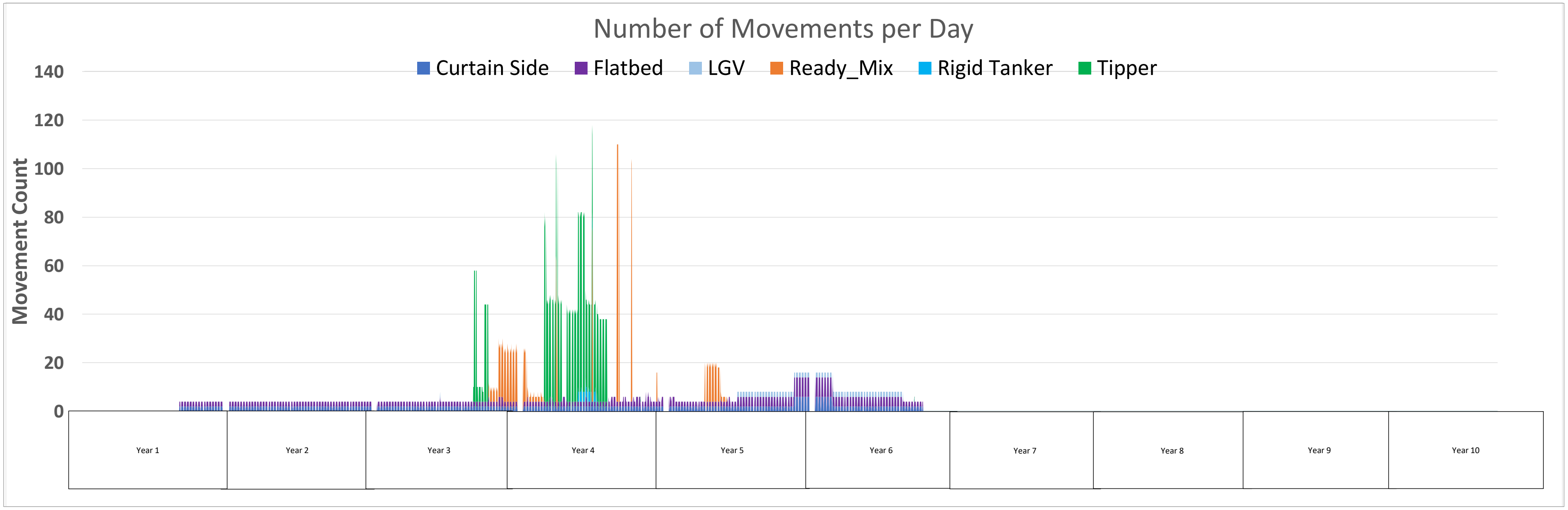
Estuary Station Section



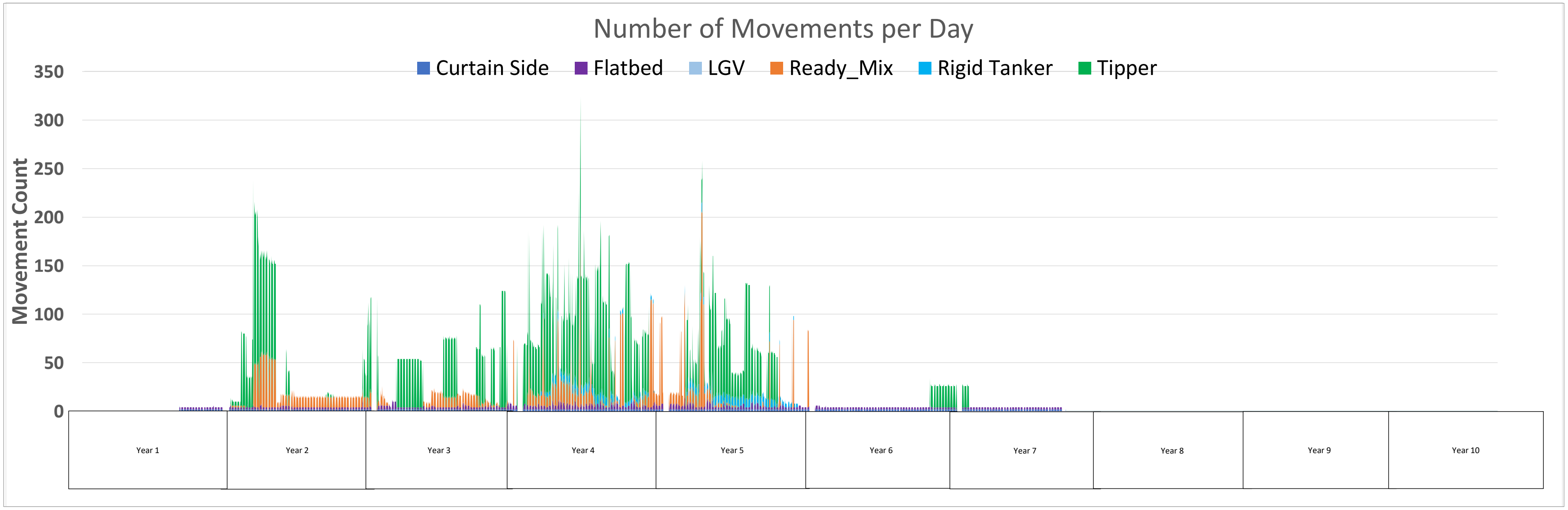
Start to Seatown Section



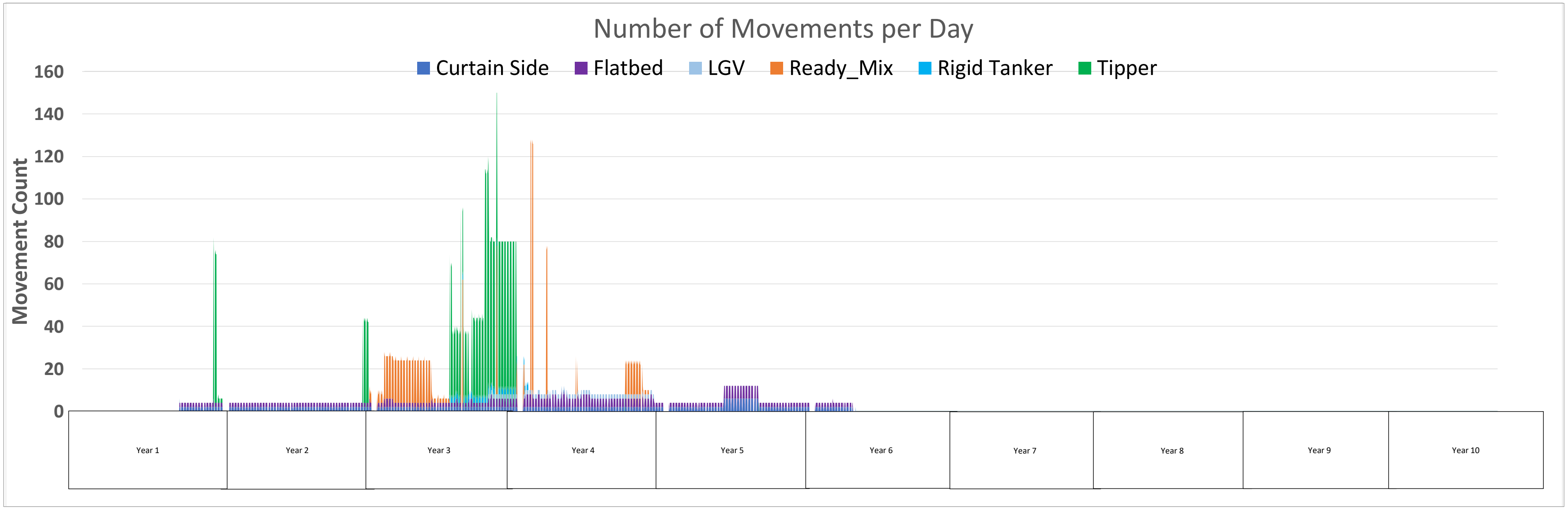
Seatown Station Section



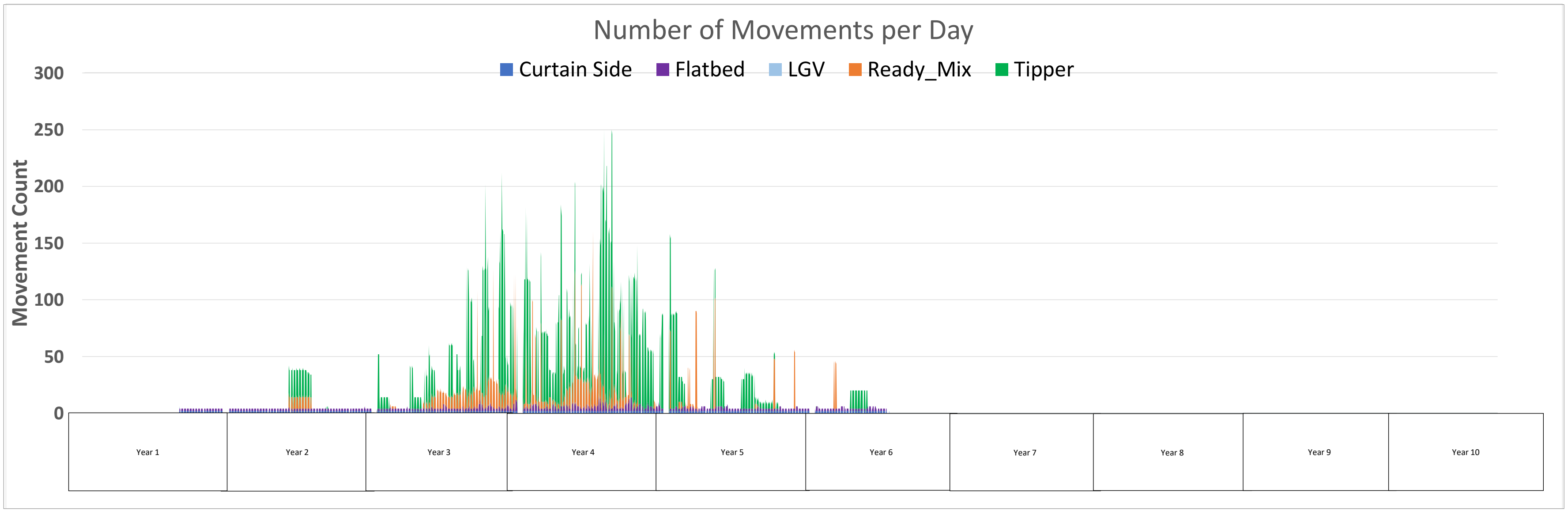
Seatown to Malahide Section



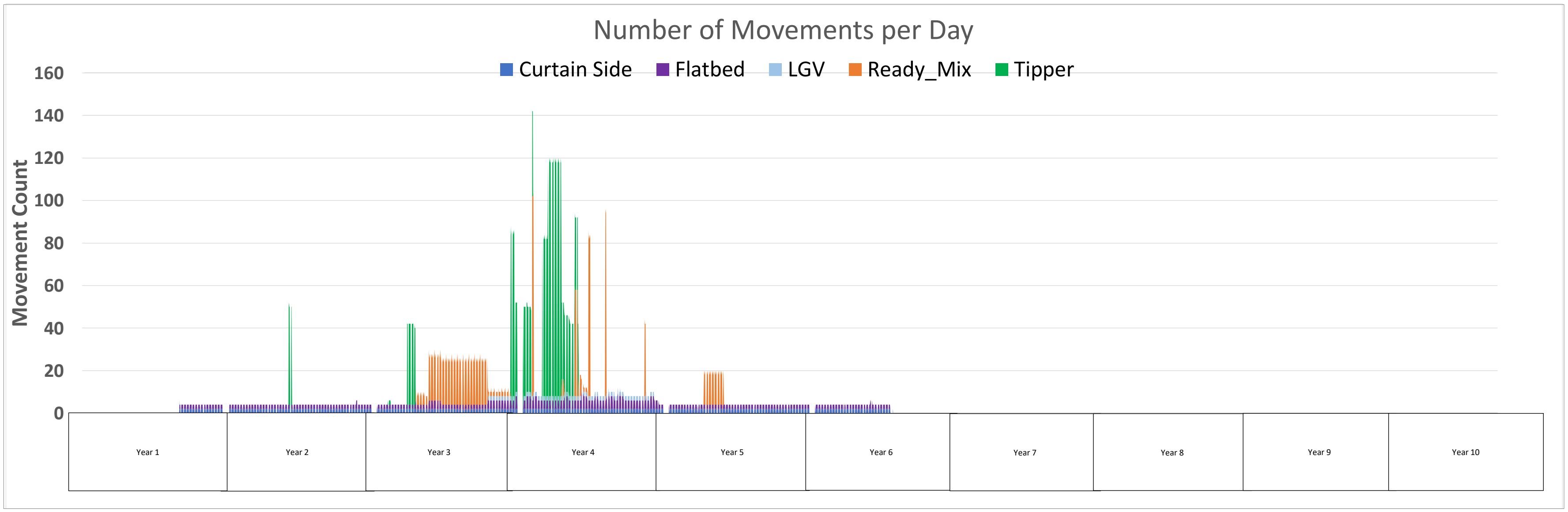
Swords Central Station Section



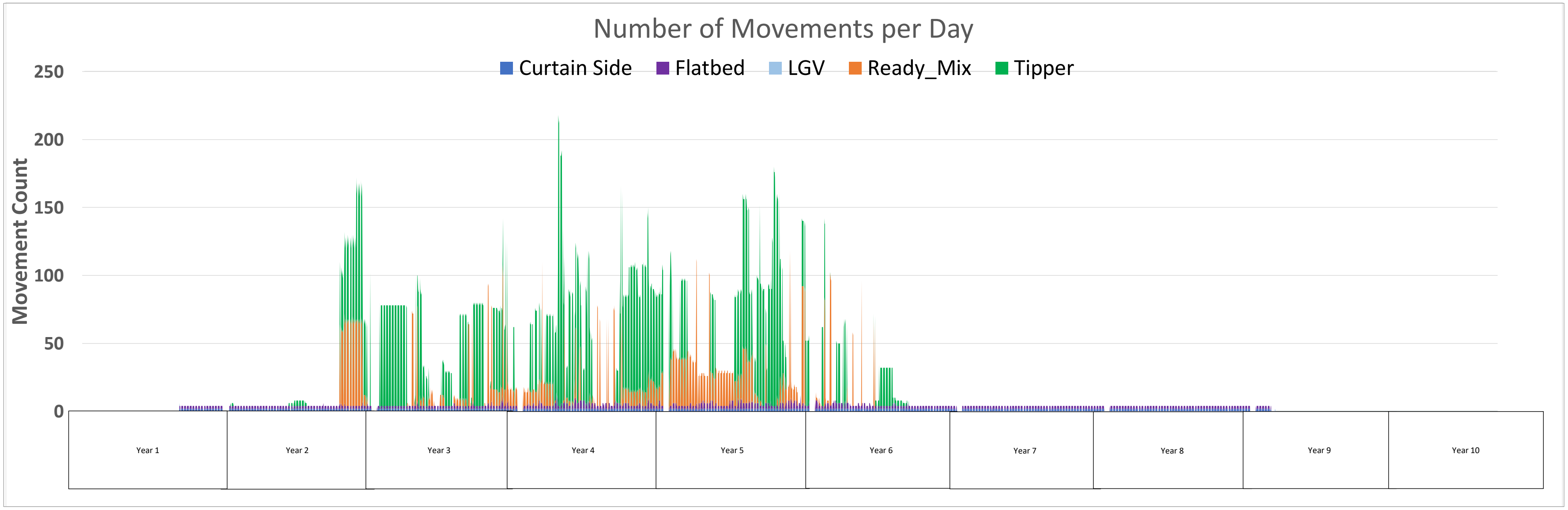
Malahide to Pinnock Section



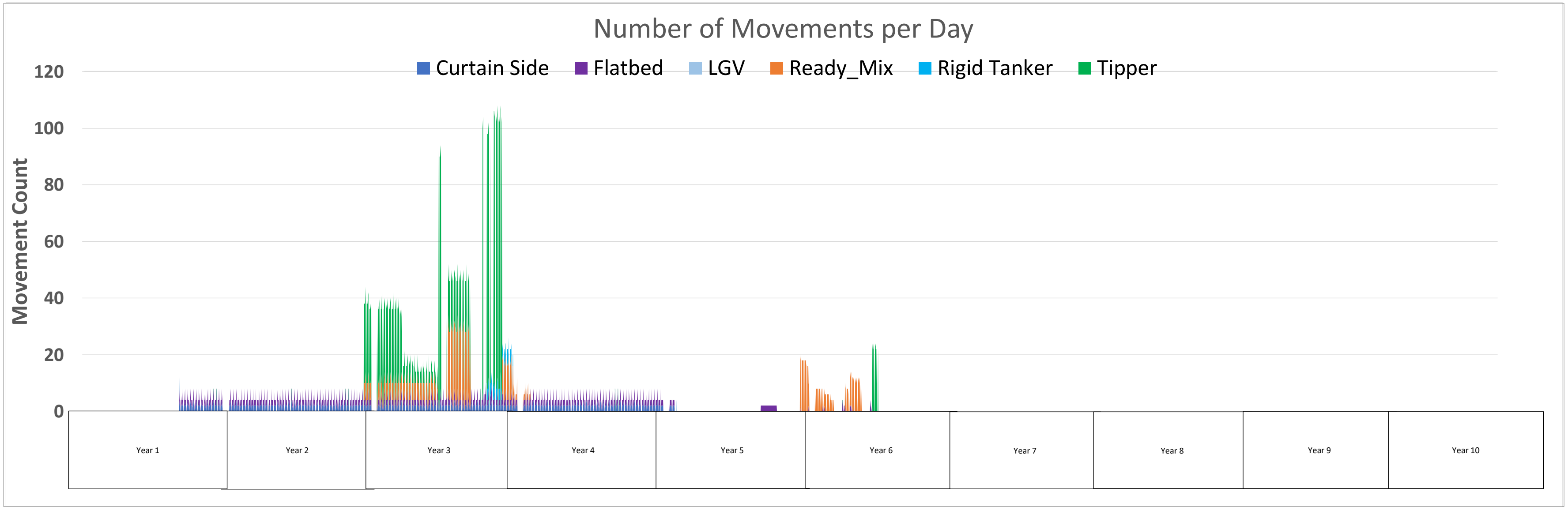
Fosterstown Station Section



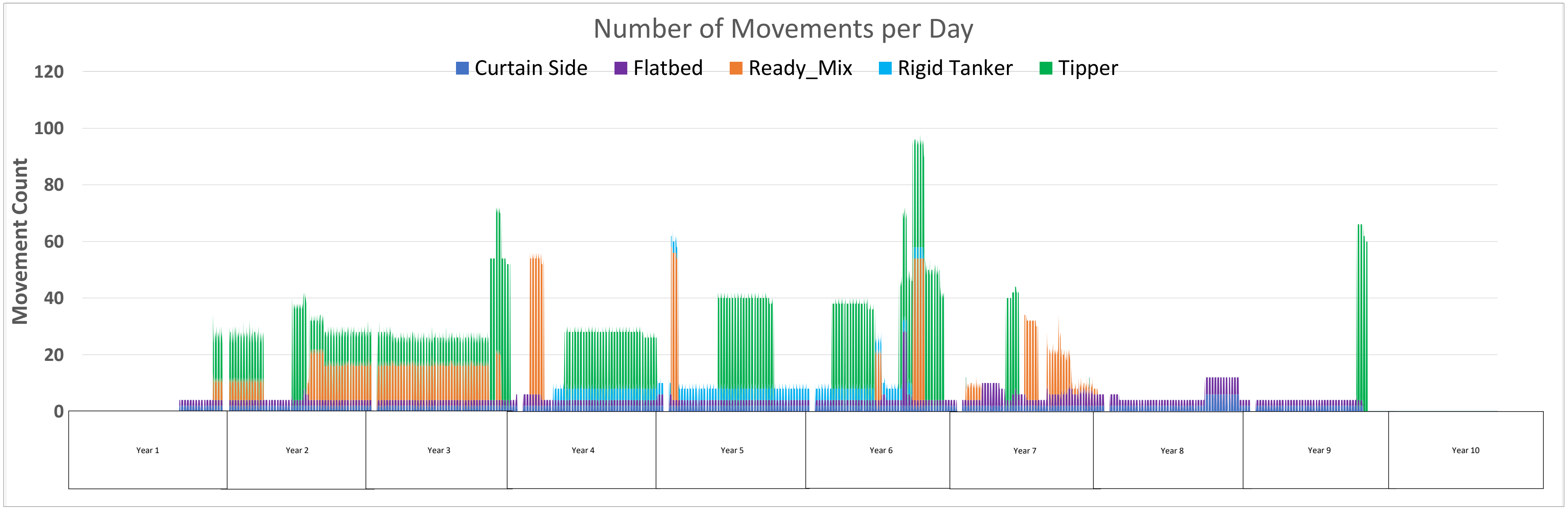
Pinnock to North Portal Section



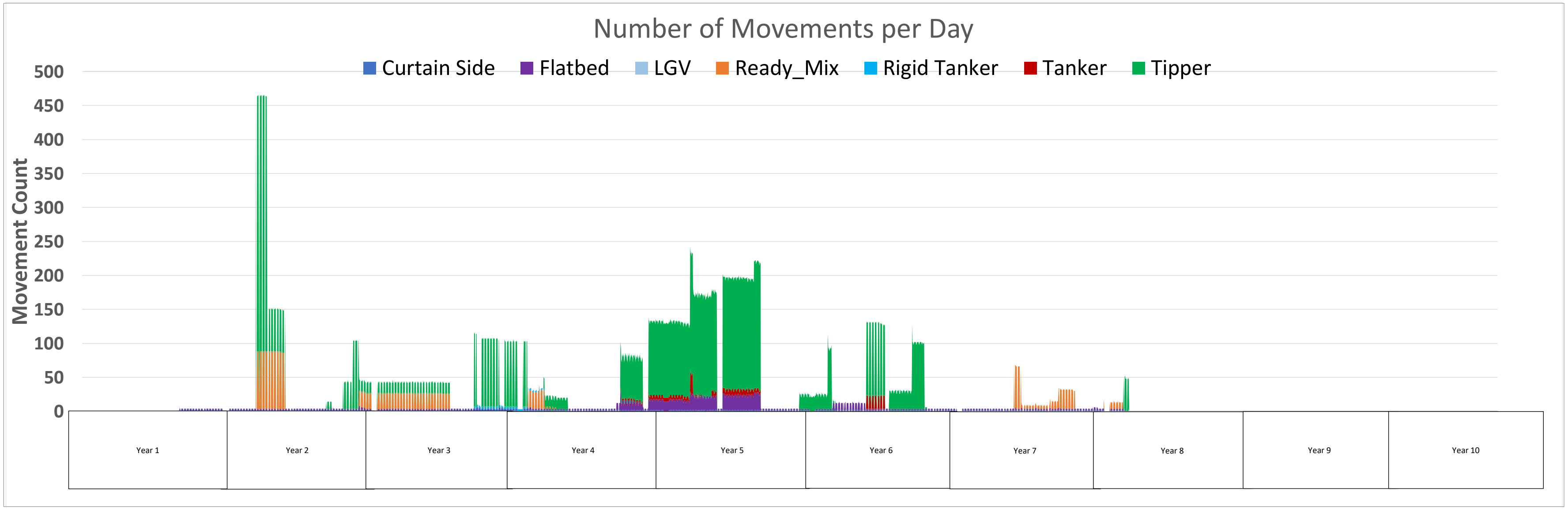
North Portal Section



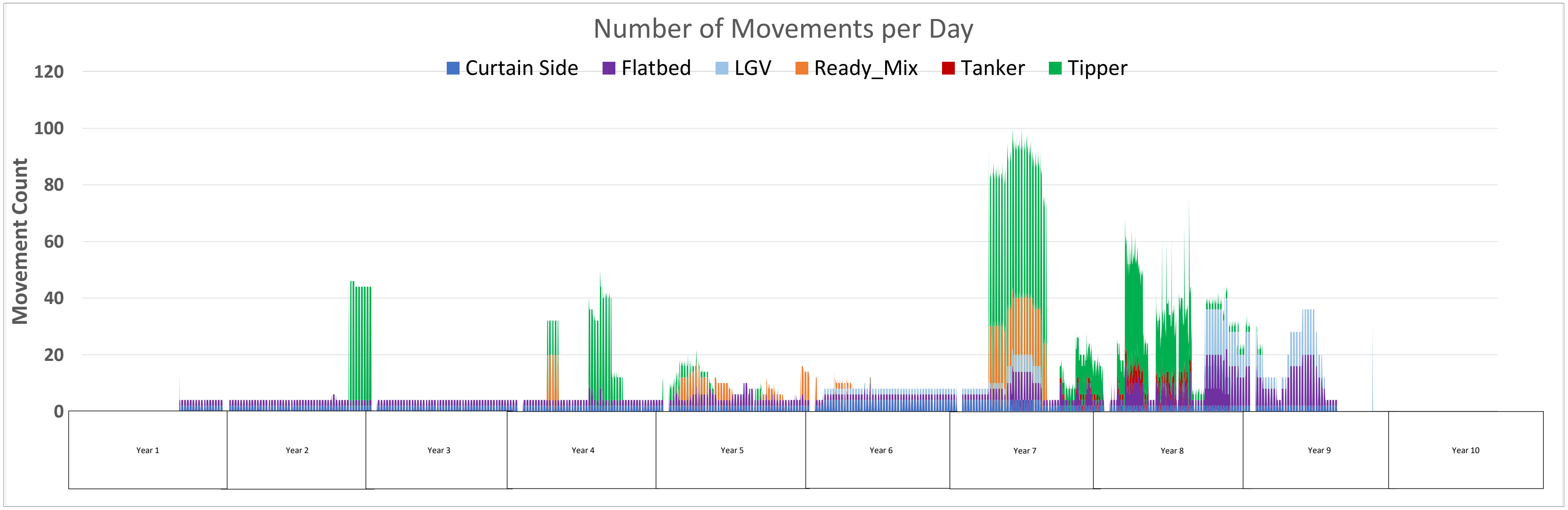
Dublin Airport Section



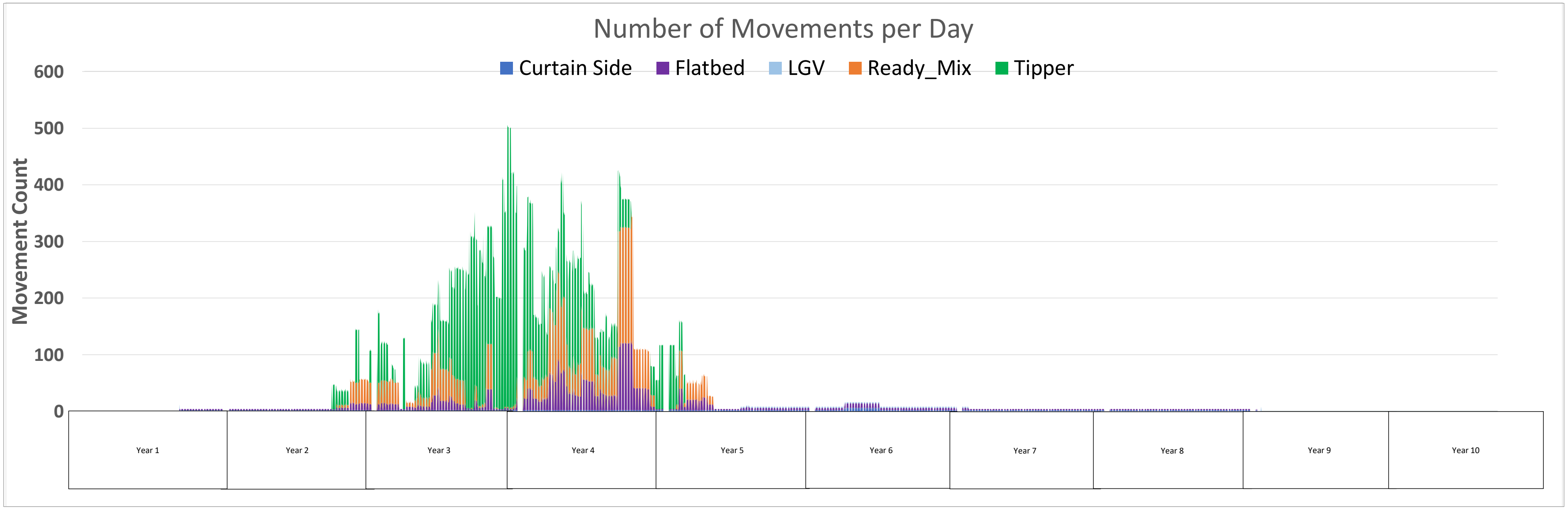
South Portal Section



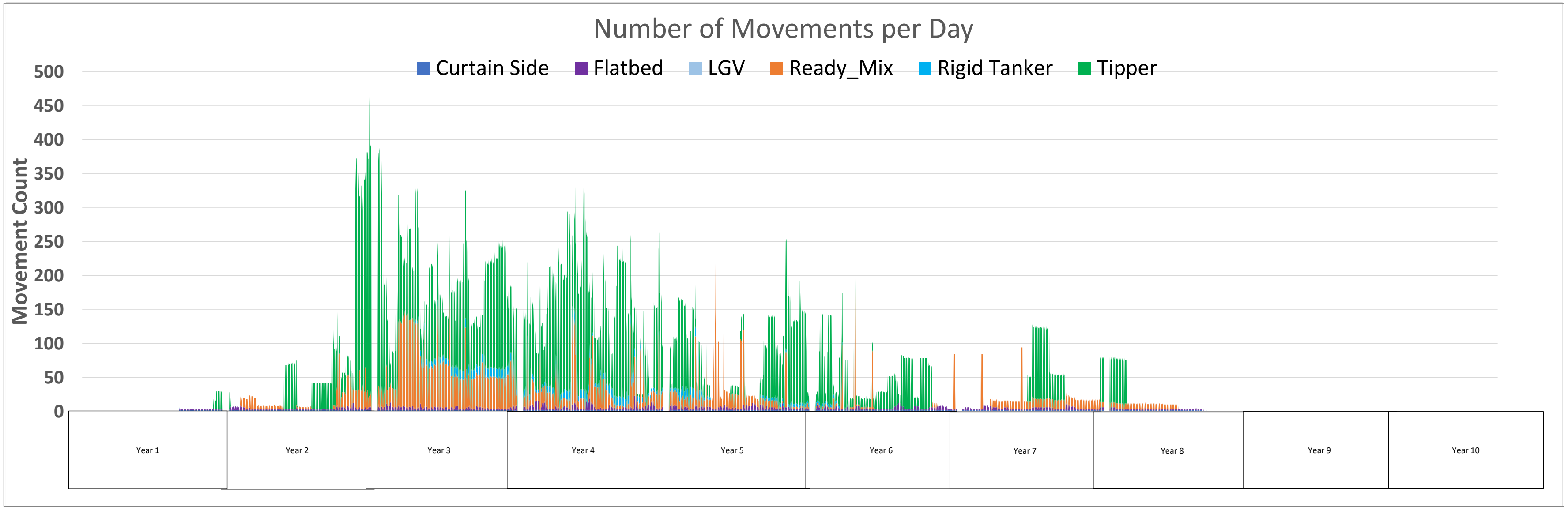
Dardistown Depot Section



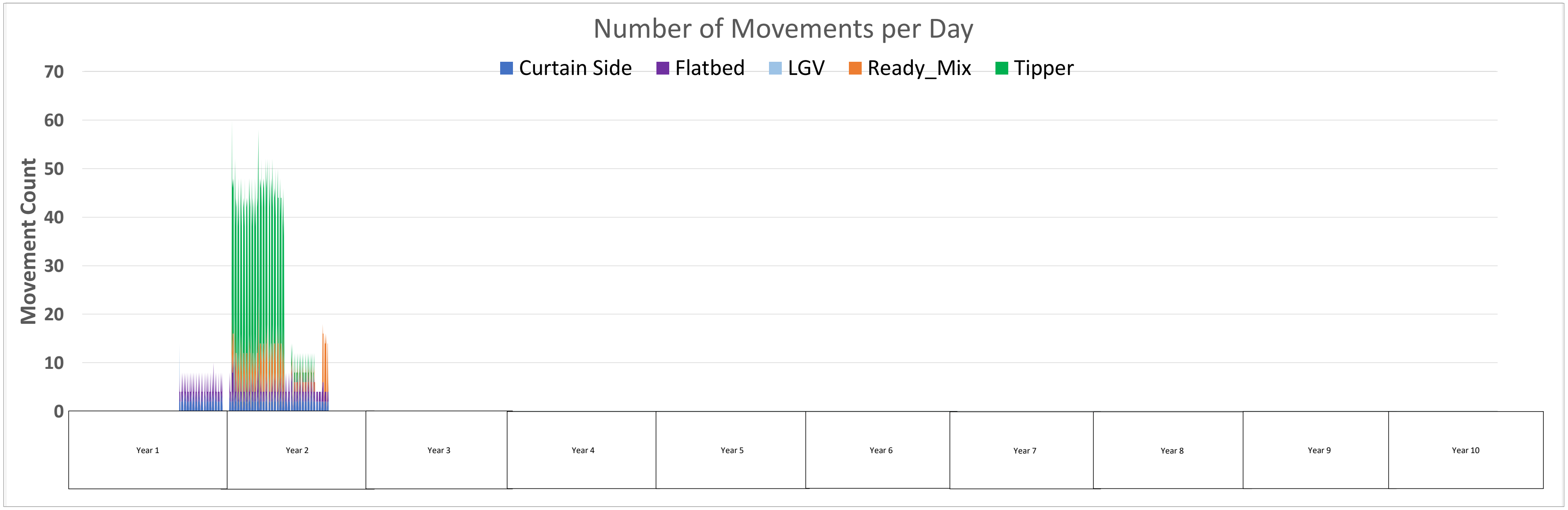
Dardistown Section



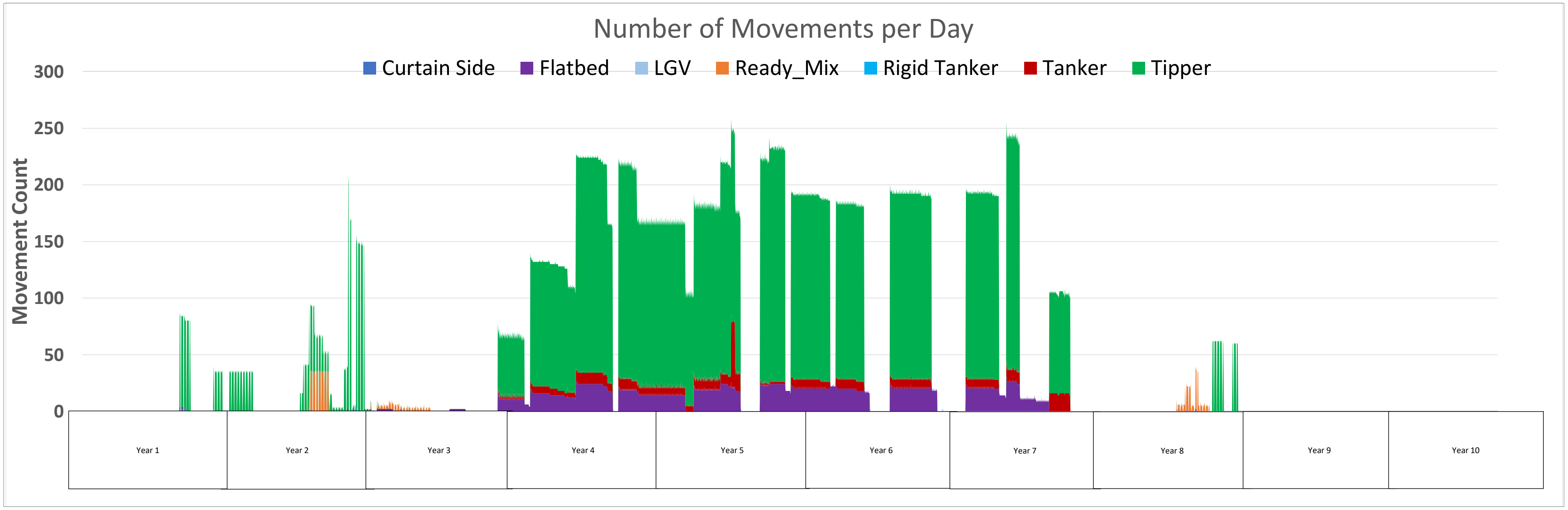
Central Section



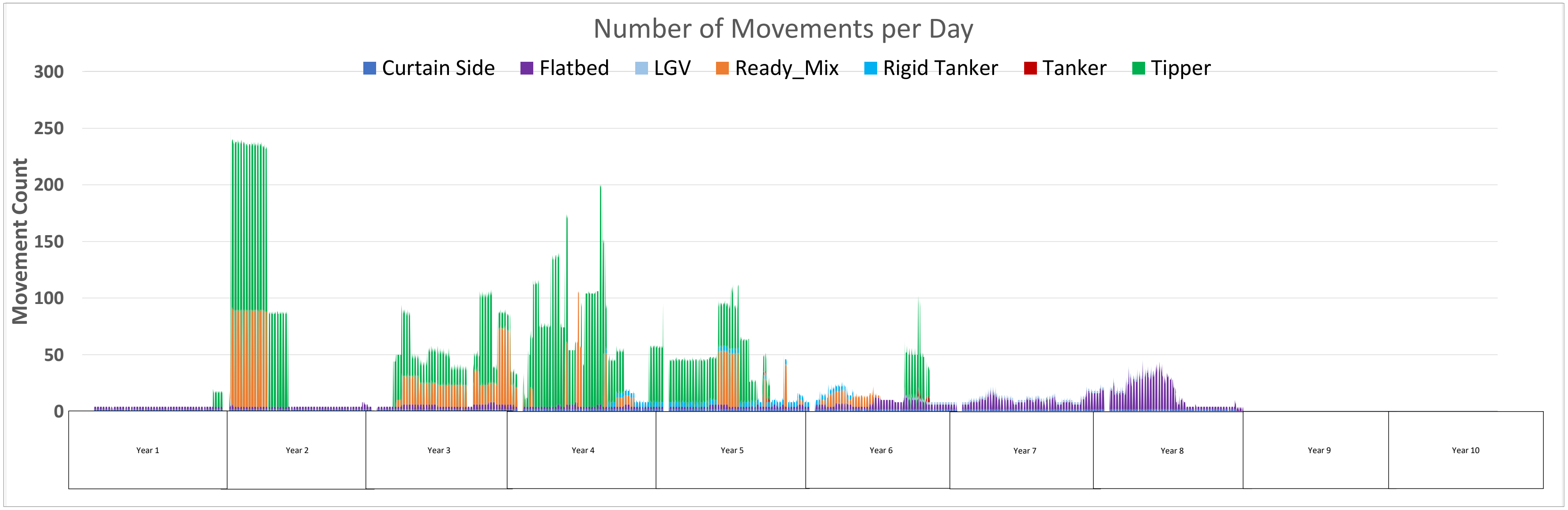
M50 Bridge Section



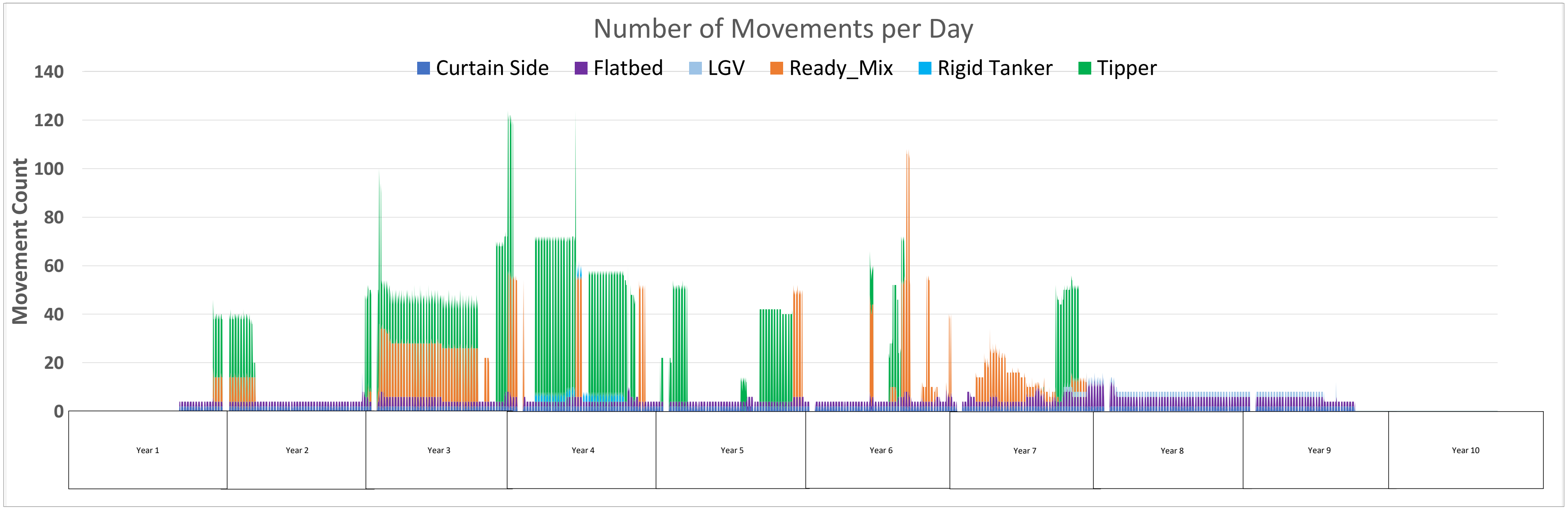
Northwood Portal Section



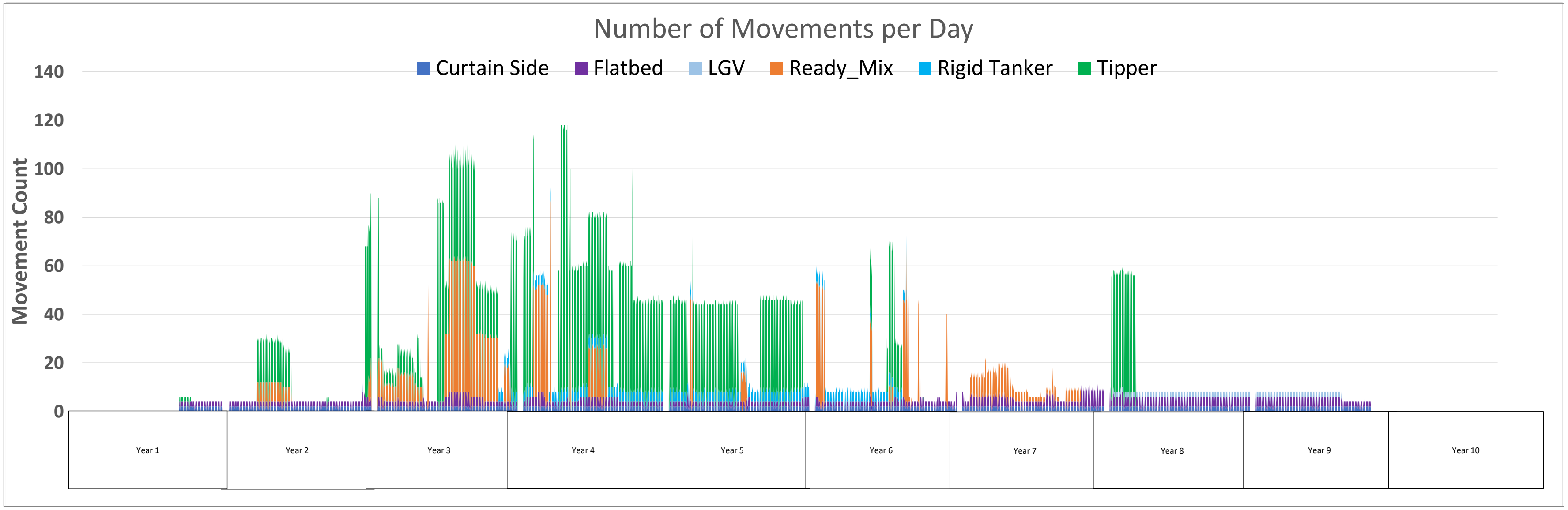
Northwood Section



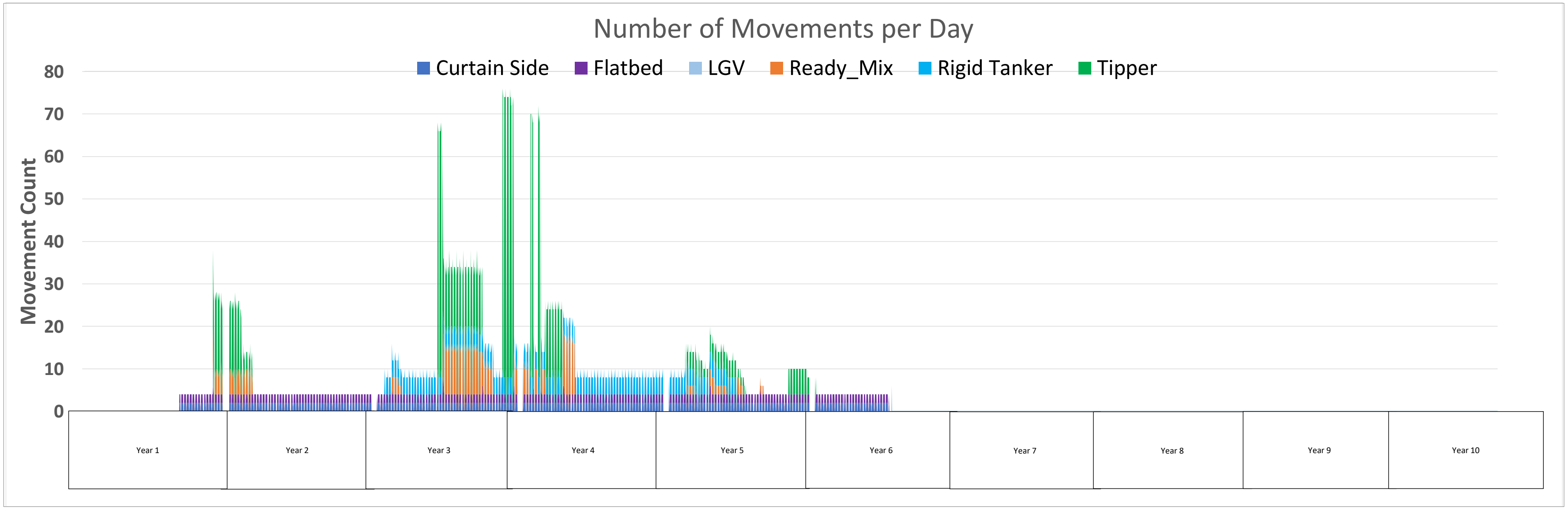
Ballymun Section



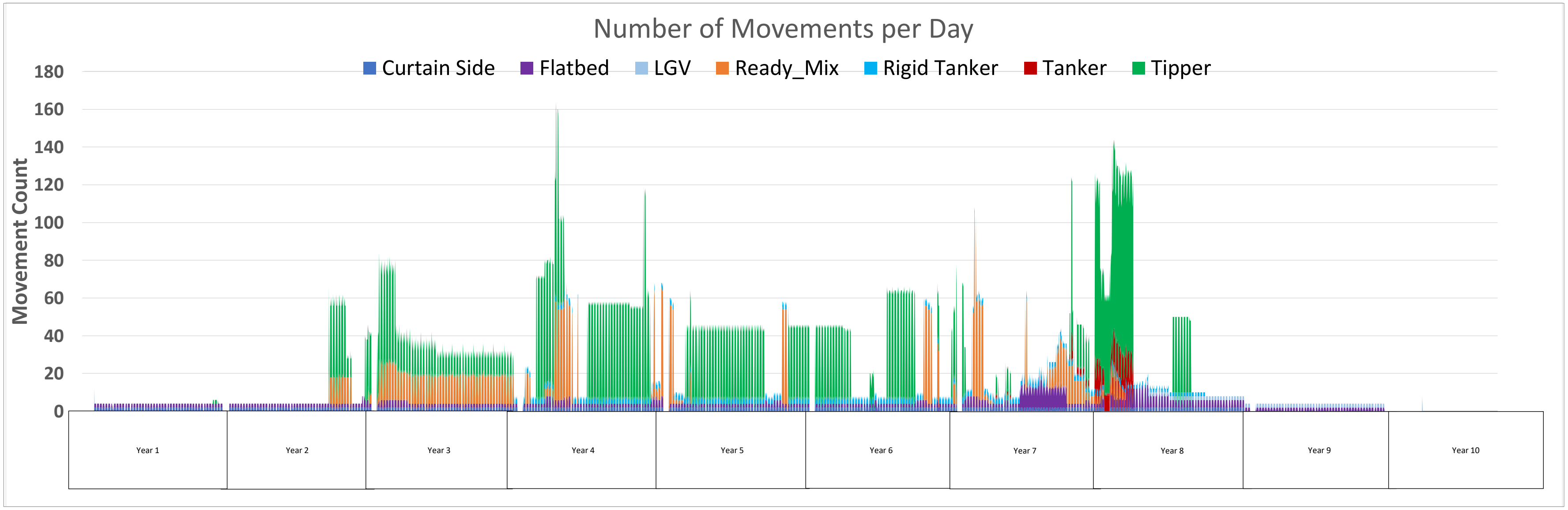
Collins Avenue Section



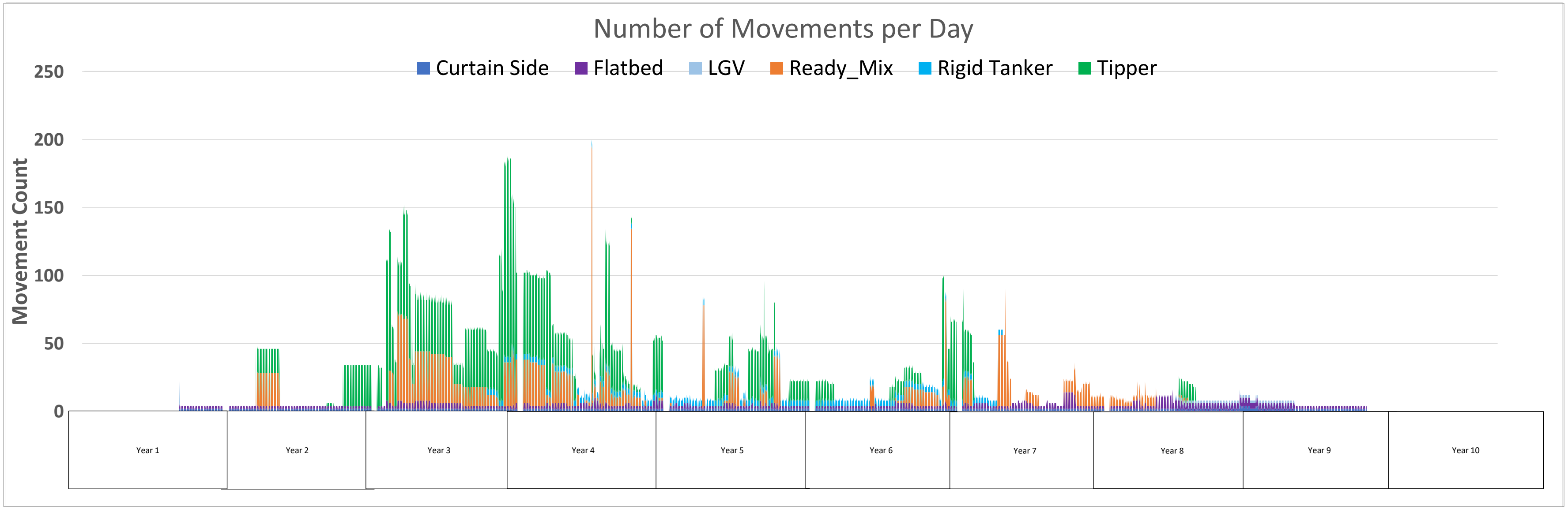
Albert College Shaft Section



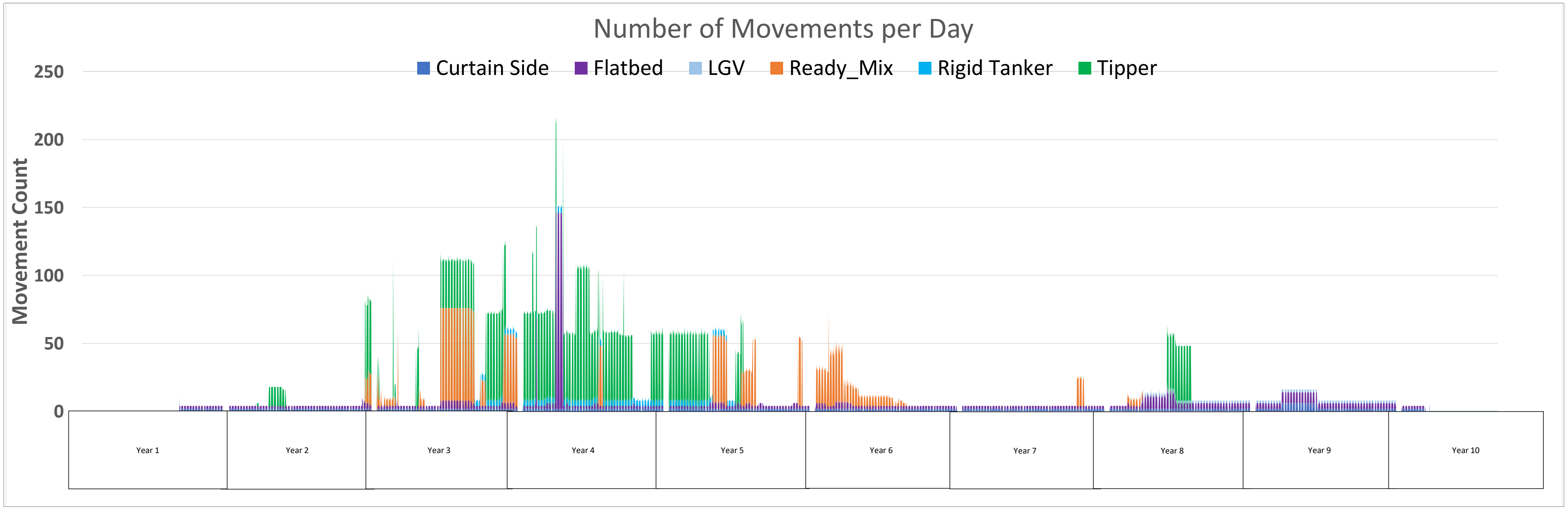
Griffith Park Section



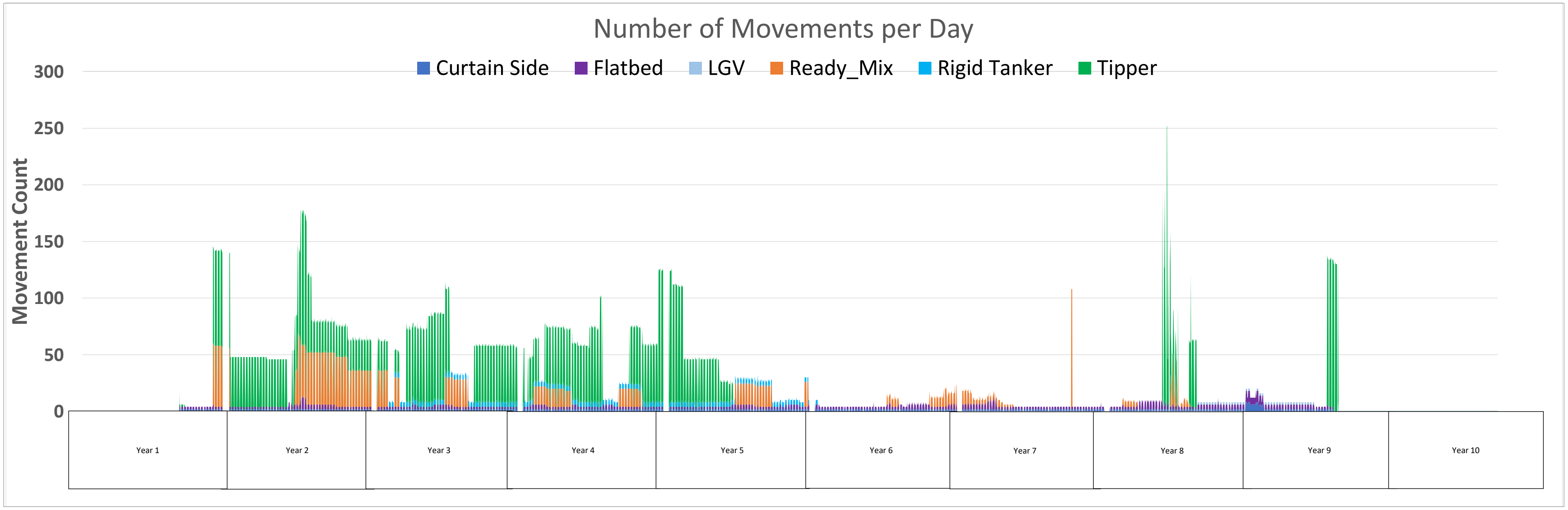
Glasnevin Section



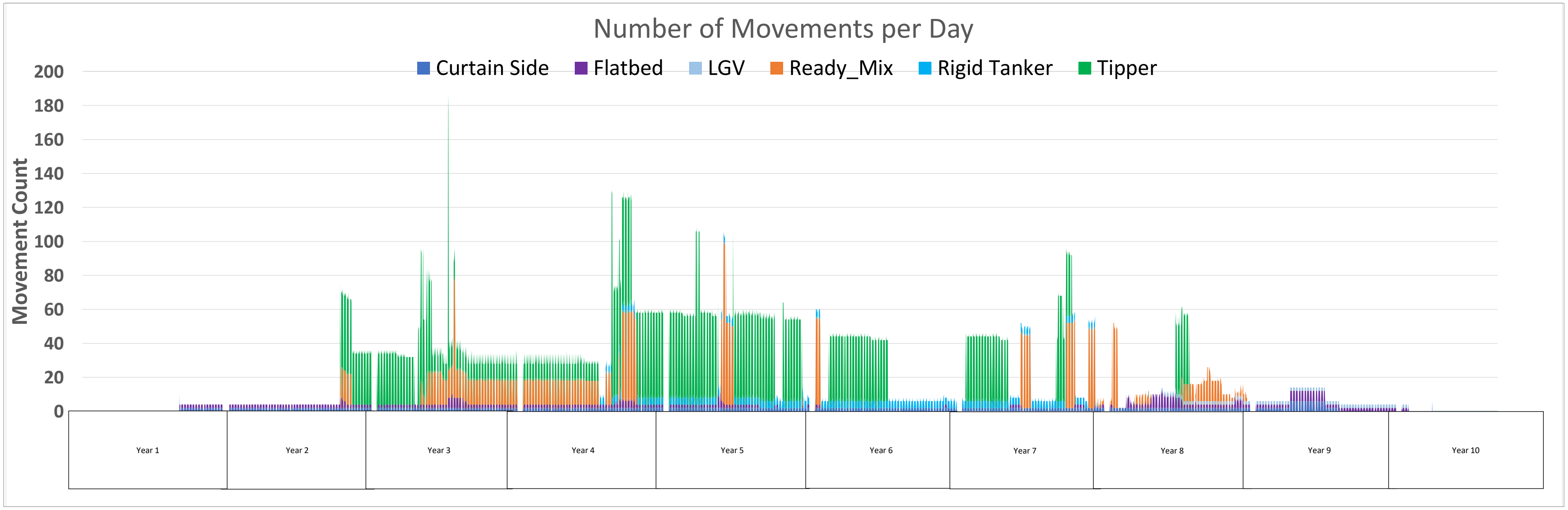
Mater Section



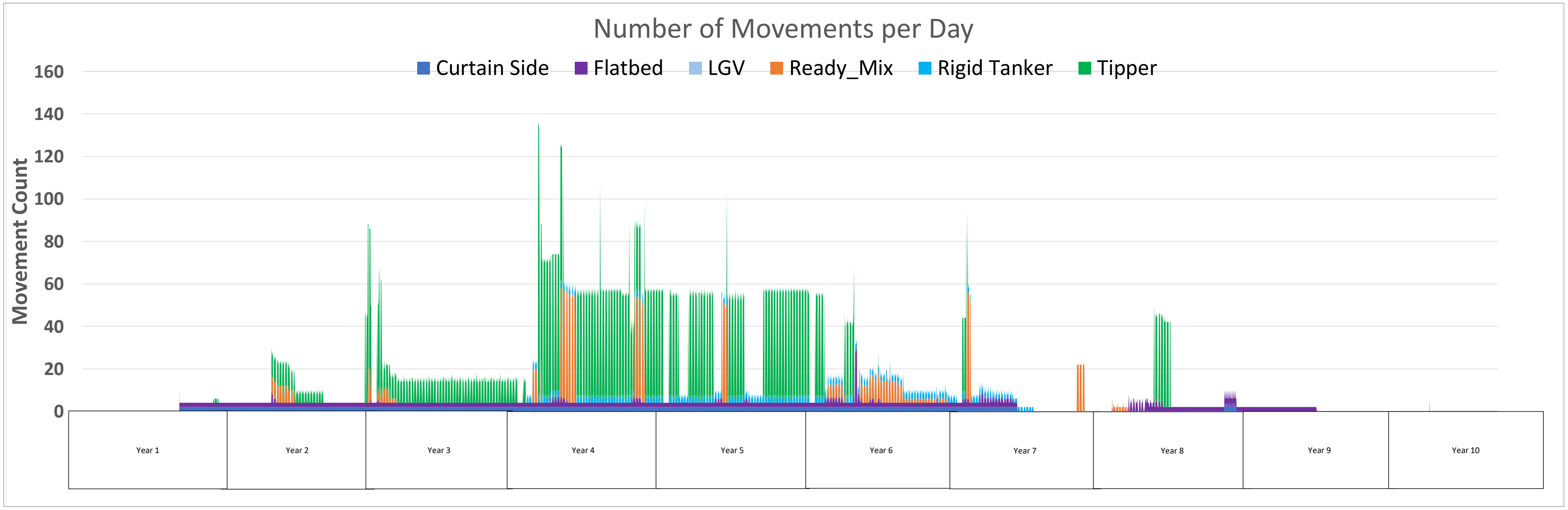
O'Connell Street Section



Tara Section



St. Stephen Green Section



Charlemont Section