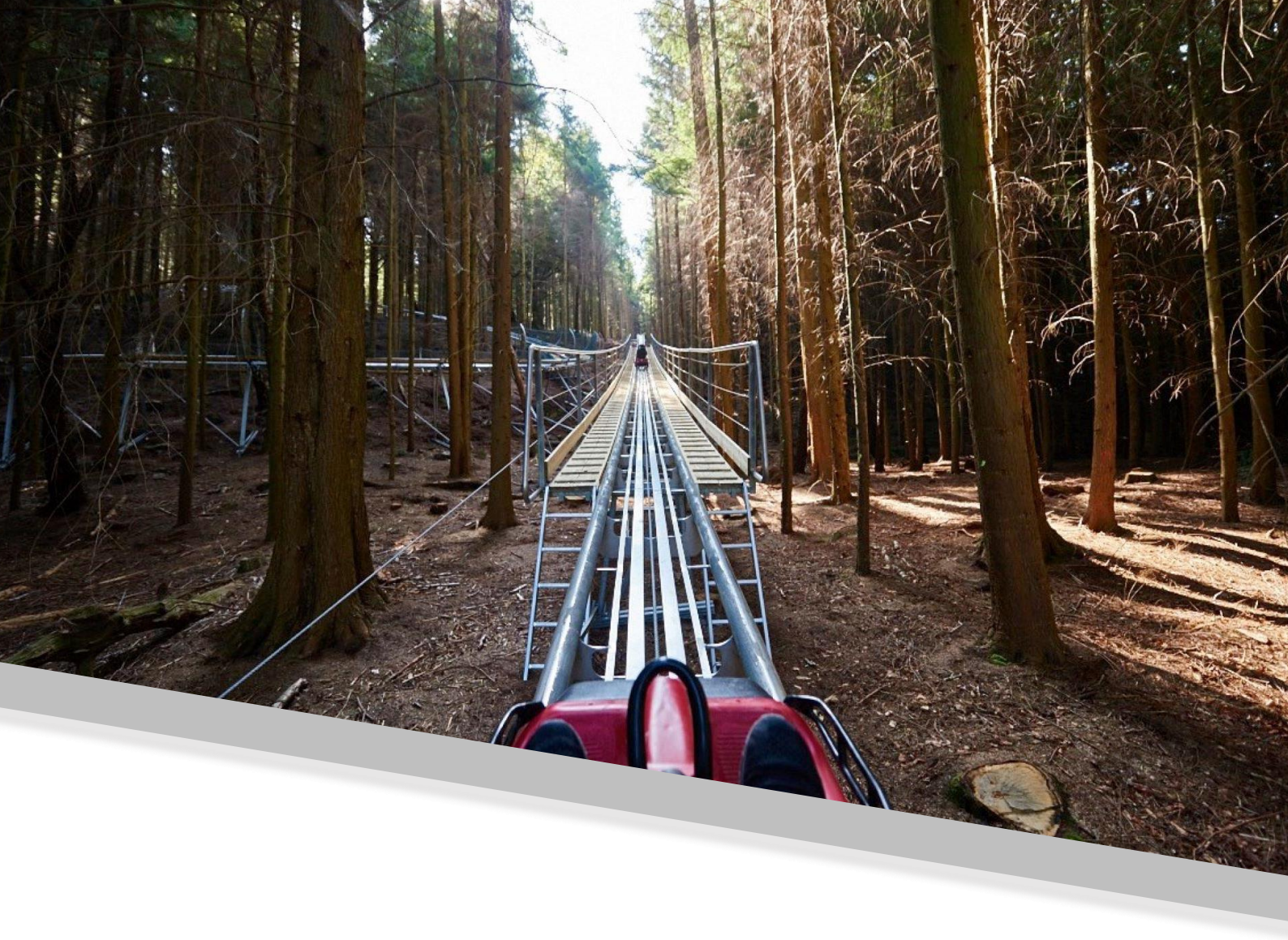

Discharge Volume Calculations

Document Reference: 612 – R1

TREATMENT PLANT ENVIRONMENTAL PERMITS AT ZIP WORLD, BETWS Y COED

MÔN CIVILS LIMITED

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Revision P02

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1.0 Introduction

This report has been compiled to assess the maximum discharge volume of two existing treatment plants located at the Zip-World Forest, A470, Betws-y-Coed LL24 0HX, in order to assist an environmental permit application with Natural Resources Wales (NRW).

Table 1. Existing Site Details

OS Grid Reference:	SH 80497 57423
Easting (X)	280497
Northing: (Y)	357423
What3Words:	triangle.baseless.rich

1.1 Existing Site

The existing development is an outdoor adventure attraction operated by Zip World at Betws-y-Coed, comprising a range of visitor activities and associated infrastructure, including adventure facilities, reception and operational buildings, access routes, parking areas and ancillary support uses.

The site currently contains two cafés, each with associated toilet facilities located in separate areas of the site. Both are served by independent package treatment plants which converge into a single pipe with a discharge into a nearby watercourse.

1.2 Calculation Method

The site's incoming water supply is from a borehole; therefore, no meter readings are available to determine the volume of water used on site or to estimate the discharge volume. Consequently, the calculation will be based on the per-person discharge volumes set out in Flows and Loads 4, the number of customers per activity, and several assumptions.

2.0 Site Information & Assumptions

As mentioned within Section 1.1 there are two cafés, each with associated toilet facilities. One located at the site entrance carpark, and one located at the top of the site within the forest near the forest coaster activity. These will be referred to within this report as: Carpark Café and Forest Café.

The Carpark Café includes;

- Four toilets and one urinal
- Four sinks including one Food and Beverage Kitchen.

The Forest Café includes;

- Eight toilets and one urinal
- Eight sinks including cleaning cupboard

2.1 Annual Customer numbers per activity

The Client has provided a list of annual customer numbers for each activity and has confirmed that approximately 30% of customers are expected to participate in more than one activity (25% - two activities and 5% - three activities). The annual customer numbers per activity are as follows:

- Festive Forest: 2,598
- Ffear Fforest: 9,168
- Fforest Coaster: 96,455
- Plummet: 5,356
- Skyride: 16,350
- Tiny Trek: 3,619
- Tree Hoppers: 13,291
- Treetop Nets: 22,471
- Zip Safari: 13,807

Total activity participations = **183,115 per annum**

2.2 Assumptions

The total annual number of recorded activity participations is 183,115. However, this figure does not represent unique customers, as the Client has confirmed that a proportion of customers undertake more than one activity.

For the purposes of this assessment, it has been assumed that 65% of customers participate in one activity only, 30% participate in two activities, and 5% participate in three activities. This results in an average of 1.4 activities per customer. On this basis, the adjusted total number of unique customers is estimated to be approximately 130,800 per annum.

The site operates seven days per week during the summer months and five days per week during off-peak periods. As a worst-case scenario for calculating maximum daily customer numbers, it has been assumed that the site operates five days per week throughout the year. This equates to a maximum of 261 operating days per annum, resulting in an average daily customer number of approximately 500 customers per day.

Customer numbers are expected to vary significantly due to on-peak and off-peak periods and weather conditions. Therefore, for the purposes of this assessment, it has been conservatively assumed that the maximum daily customer number is three times the average, equating to approximately 1,500 customers per day.

During Peak periods there is expected to be a maximum of 20 staff members working on the site.

Toilet and Urinal Usage Assumptions:

- 50% of all Costumers will utilise a toilet during their visit
- 10% of all Costumers will utilise a urinal during their visit
- 100% of all staff members are expected to utilise a toilet or urinal twice per day.

Café Assumptions:

- The Forest Café and toilet block more readily used as opposed to the Carpark Café, with an expected split of 70% - 30% in favour of the Forest Café. This is based on turn-over from each of the cafes.
- It is expected that 30% of all customers will use either of the cafes.

2.3 Flows and Load 4

The table below sets out the estimated water discharge per person, per activity, per day (unless otherwise specified), based on the guidance in Flows and Loads 4. These standard values are used to calculate the site's wastewater generation for each activity and facility type.

Table 2. Flows and Loads 4 – Foul flows per activity

Per person / activity / day (unless otherwise specified)	**FLOW (Litres)**
Restaurants Snack Bars & Bar Meals	15
Toilet Flushes	10
Urinal Usage	5

3.0 Discharge Volume Calculations

Using the assumptions and obtained site data set out in **Section 2.0**, the total maximum daily wastewater volumes can be estimated by multiplying the per-person discharge values from *Flows and Loads 4* by the expected number of users for each facility type.

Assumptions applied:

- Peak daily customers: 1,500
- Staff: 20
- Toilet usage: 50% of customers use toilets, 10% use urinals; staff use toilets/urinals twice per day
- Café usage: 30% of customers, split 70% Forest Café / 30% Carpark Café

Table 3. Maximum Daily Waste Water Voume Calcaultion Table.

Facility / Activity	**Flow per person (L)**	**Forest Plant (L/day)**	**Carpark Plant (L/day)**
Toilets (customers)	10	*(1,500 × 50%) × 70%* × 10L **5,250 L**	*(1,500 × 0.5) × 30%* × 10L **2,250 L**
Urinals (customers)	5	*(1,500 × 0.3)* × 70% × 5L **1,575 L**	*(1,500 × 0.3)* × 30% × 5L **675 L**
Toilets/urinals (staff)	10 x 2 Uses	(20 × 2) × 70% × 10L **280 L**	(20 × 2) × 30% × 10L **120 L**
Cafés (food & drinks)	15	(1,500 × 0.3) × 70% × 15L **4,725 L**	(1,500 × 0.3) × 30% × 15L **2,025 L**
Total Per Plant		**11,830 L**	**5,070 L**
Total Maximum Daily Discharge		**16,900 L/Day**	

Based on peak visitor numbers (1,500 persons/day), conservative per-capita wastewater generation rates, and full staff attendance, the maximum daily foul water discharge from the site is calculated to be approximately 16.9 m^3/day (16,900 L/day)