



CRAIG Y NOS HABITAT MANAGEMENT PLAN

Habitat Science (M2X9622)

ABSTRACT

This report aims to understand the current Habitat Management Plan at Craig Y Nos, looking at current constraints and opportunities for improvement.

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Introduction

In 1949, the National Parks and Access to the Countryside Act was made law by parliament. This enabled authorities to follow similar conservation of wildlife, flora and fauna to that of the National Parks in Africa and America (Sheail, 1975). The conflicts for anthropogenic activities and The National Park ethos have continued to interact and the need to strike a balance has been prevalent since its creation (Stockdale and Barker, 2009). The use of the Sanford Principle is adopted to weigh conservation of the environment where anthropogenic needs may negatively influence the conservation necessity (McCarthy *et al.*, 2002).

Of significant interest of these principles is Craig Y Nos Country Park. It is located at the southern end of the Brecon Beacons National Park, within the Black Mountain Range and Fforest Fawr (shown in fig1a).

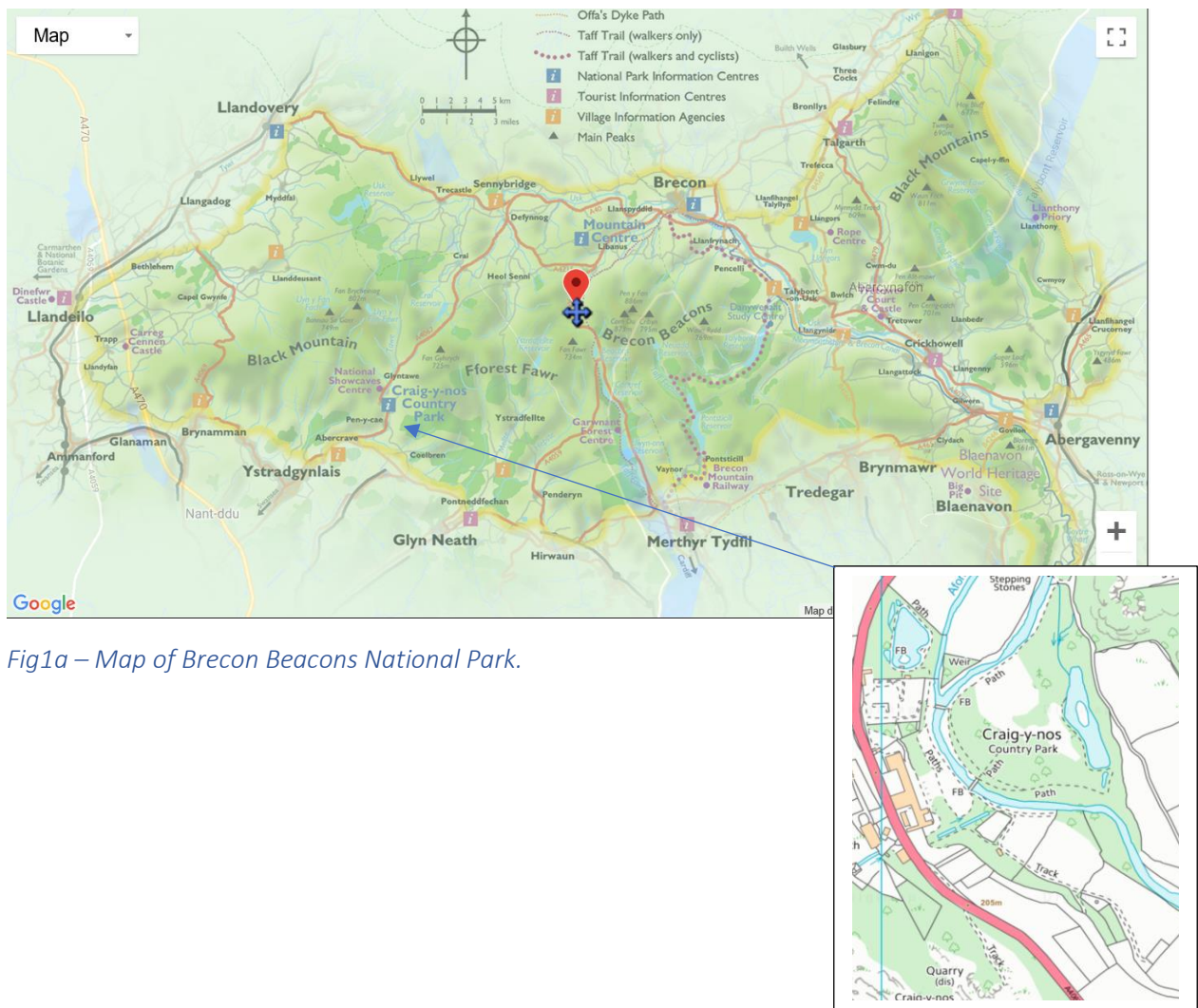


Fig1a – Map of Brecon Beacons National Park.

History

Craig Y Nos has a significant historical past, linked closely with the adjacent castle. In the late 1800's, the renowned opera singer Madame Adelina Patti bought the castle with 1000 acres of land. Much of the gardens within the country park today were designed and cultivated with her vision (Lerner, 2017).

Following her death at the castle in 1919, the castle was converted into a hospital to treat tuberculosis and later was a hospital for the elderly until it closed in 1986.

The grounds of the castle were sold to the Brecon Beacons National Park Authority (BBNPA) in 1976. In 1995, the BBNPA was obligated to produce a management plan under the Environment Act 1995 (Government, 1995). This requires the park to set out a vision for a 20-year horizon, reviewed every five years (Asset Management Plan period - AMP). Within the plan, the authority has a duty to "conserve and enhance the natural beauty, wildlife and cultural heritage" (BEACONS-NPA.GOV.UK,2015) and also "to promote opportunities for the understanding and enjoyment of the special qualities of national parks by the public" (BEACONS-NPA.GOV.UK, 2015).

Habitats

In order to understand Craig Y Nos Country Park, there is a need to carryout a Phase 1 Habitat Survey. Figure 1b is an abstract from digimap that identifies the main habitats within the country park. These can be broken into seven categories identified in Table 1.

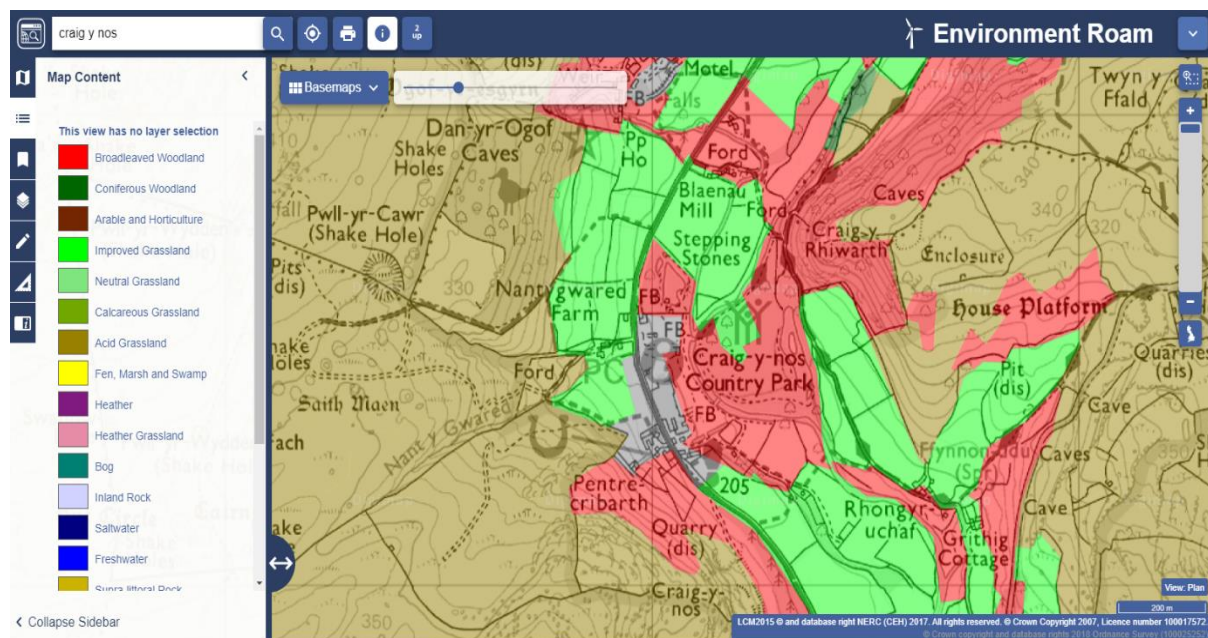


Fig 1b – Digimap abstract Craig Y Nos and surrounding area

Table 1 – Identifying Habitat Type within Craig y Nos

Habitat Type	Description
Broadleaf Woodland	• Beech Woods- This is the abundant species. • Silver Birch (<i>Betula Pendula</i>). • Stands of Lime (<i>Tilia Cordata</i>). • Hazel (<i>Corylus Avellana</i>). • Alder (<i>Alnus Glutinosa</i>). • Hawthorn (<i>Crataegus Monogyna</i>).
Coniferous Woodland	• Rhododendron. • Black Pine (<i>Pinus Nigra</i>).
Parkland	• Main Carpark. • Pavilion Lawns. • Meadows (Main and small)
Ponds	• Duck Pond (Small grit pond at the entrance to the duck pond). • Far Pond.
Hay Meadow	• Used continually since 2004
Rivers	• Nant y Gward. • River Tawe • There is a confluence of both rivers within the park. • The rivers flood regularly within the park. The Hay Meadow is particularly subject to these flood events.
SSSI	• Craig y Rhiwarth adjacent to the Craig Y Nos

Within the Country Park there are also several historic buildings, these are classed in Table 2.

Table 2 – Identifying historic buildings within Craig y Nos

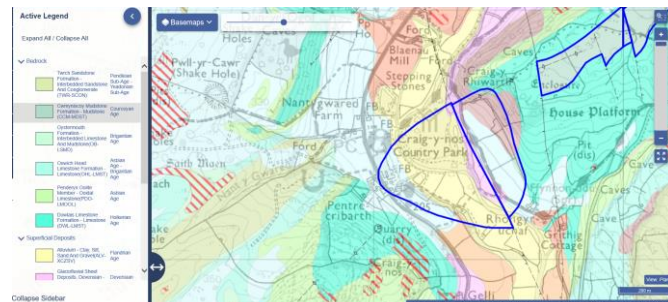
Visitor Centre, Office and Staff Accommodation, Classroom and Boiler Room	Originally Victorian gardener's cottage. Extended in the past (date unknown) and extended recently (classroom, boiler room in 1992, toilet block in 2000)
Old Craft Shop and disabled toilet / baby changing room	Victorian
Tool Shed	Victorian, formerly kennels
Welly Shed	Victorian
Game Room	Victorian
Old Toilet Block	Victorian
Environment Agency flood warning station	1995

Geology

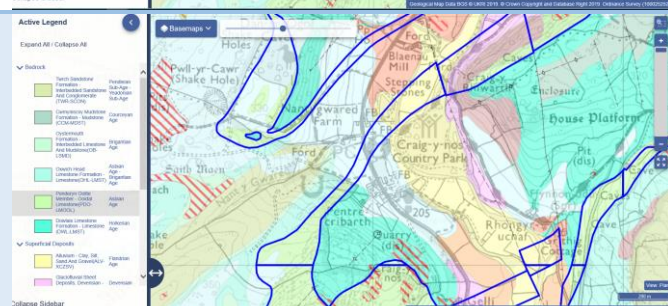
The geology of the area has been profiled utilising a digimap format. From the extracts in Table 3, you can see that the bedrock is made up of several types, typical of glacial formation within the valley (Walker, 1980.). The valley also has a 'U' shaped form, also typical of glaciation (Montgomery, 2002).

Table 3 – Bedrock and Superficial Deposits

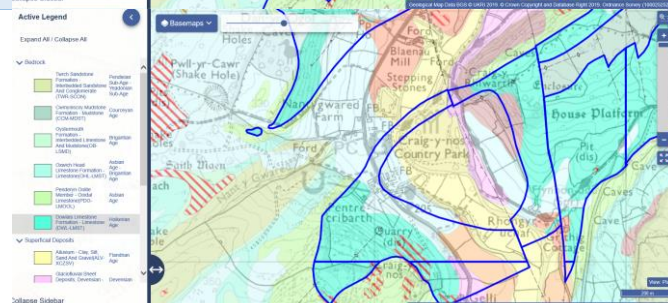
Cymyniscoy Mudstone



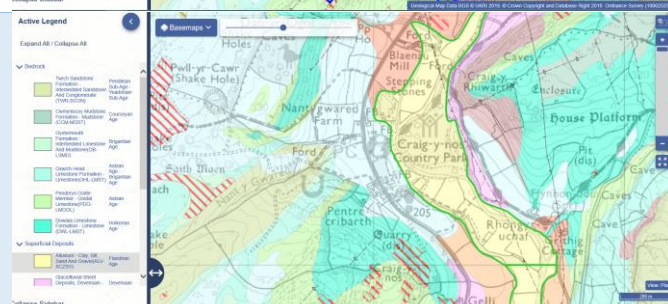
Penderyn Oolite Limestone



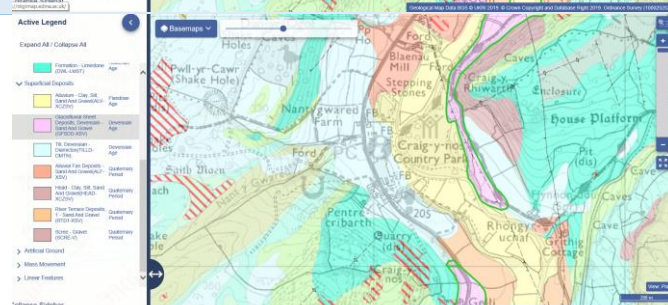
Dowlais Limestone Formation



Alluvium – Clay, Silt, Sand, Gravel



Glaciofluvial sheet deposits

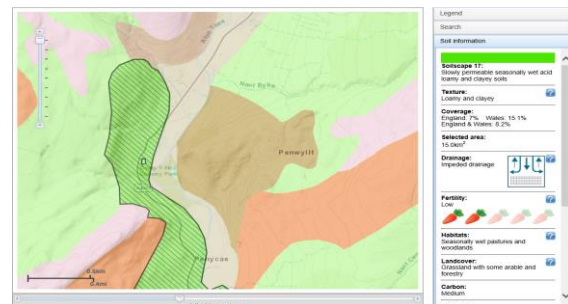


Soil Profile

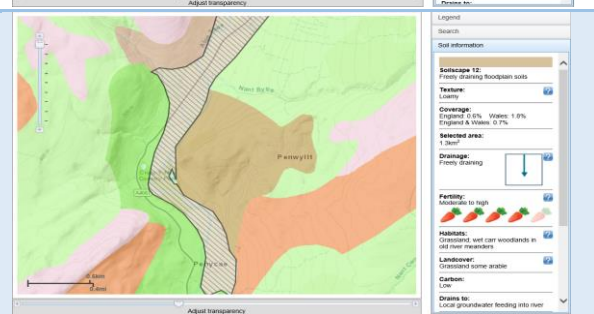
The soil profile within the country park is typical of fluvial flood plains (Table 4), with the River Tawe frequently flooding the area (Fig 4a and 4b). Whilst the deposits during flooding add alluvium to the soils, the Hay Meadow suffers from the deposition during these events (Werner and Zedler, 2002). Compare this to the soils within Craig y Rhiwarth SSSI, the soils are free draining and slightly acidic but base rich soils. This enables abundance of the rare wildflower and unimproved limestone grassland. The SSSI flora also includes soft-leaved sedge, small scabious, limestone bedstraw. Within the upland of the SSSI flora includes Lilly-of-the-valley, wood spurge and wood fescue. A stark contrast to the profile within the country park.

Table 4 – Soil profile of Craig Y Nos and surrounding area

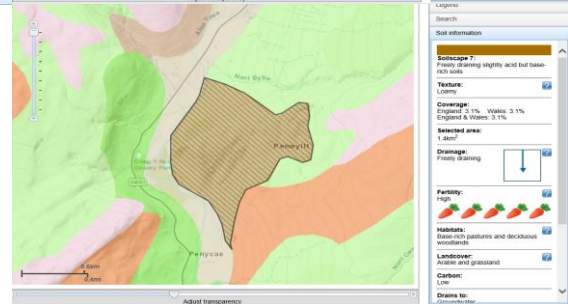
Slowly permeable, seasonally wet acidic loamy and clayey soils.



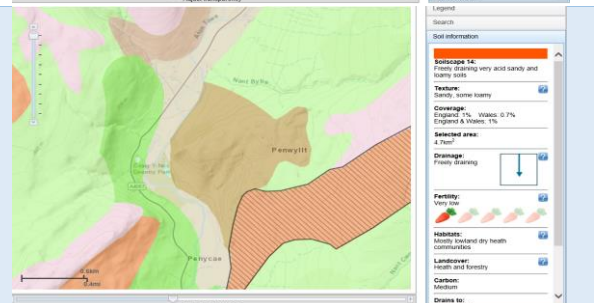
Free draining floodplain soils



Freely draining slightly acidic but base rich soils



Freely draining, very acidic sandy and loamy soils.



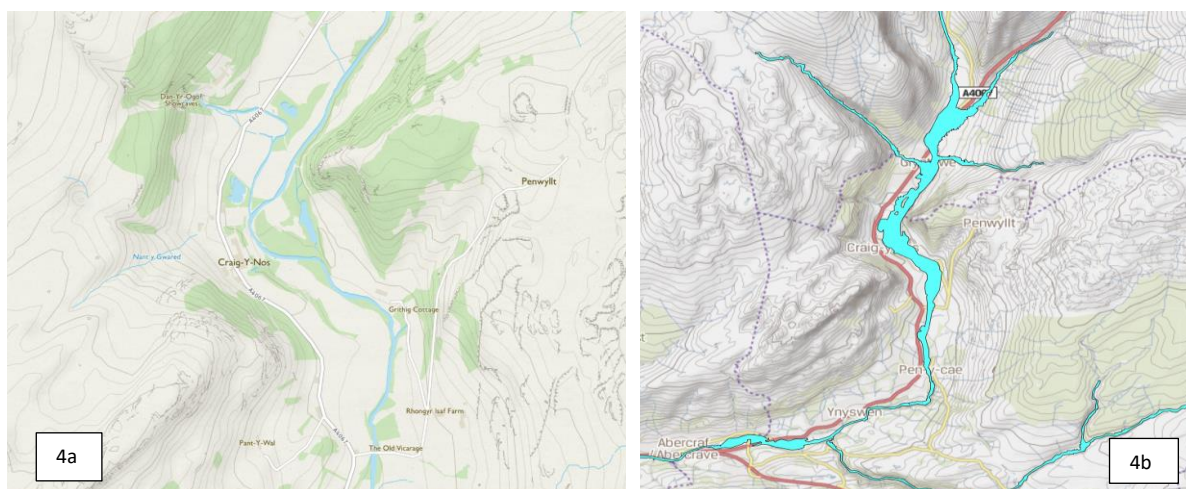


Fig 4a – Craig-Y-Nos Ordnance Survey map highlighting the confluence of the Rivers Tawe and Nant Y Gwared and Fig 4b - Flood Plain Download from NRW

Users, Conflicts, Vandalism and Rights of Way

Craig Y Nos Country Park is fundamentally operated as a tourist attraction, with several franchised businesses operating within the park. During summer peak season, the car park is stressed as the park is frequented with good numbers. It utilises a carpark fee to subsidise the Country Park (Table 5 – Parking Fee's).

Throughout the year, the Country Park is frequented by mostly families and dog walkers. There is a social media group "Friends of Craig Y Nos", who discuss events and help needed by the park.

There doesn't appear to be significant structural vandalism within the country park. However, due to the fact there are four public rights of way, erosion of pathways, trails, tree sapling and soil, with concerns focused around the picnic area. The conflict between anthropogenic activities are identified in Table 6.

The park operates a zero litter bins or dog waste policy within the park itself but has litter bins near the cafe and dog waste bin within the carpark. On several visits, litter hasn't been observed, or dog mess within the park. This policy appears to be working well.

Table 5 – Car Park Fee's

Short Stay (up to 2 hrs)	£1.50
Long Stay (over 2hrs)	£2.50
Disabled Badge	Free
Season Ticket (Craig Y Nos only)	£30 per year
Season Ticket (National Park Visitor Centre only)	£30 per year
Season Ticket (Craig Y Nos & Visitor Centre)	£39 per year

Table 6 – Anthropogenic Conflicts

User	Main problems
General users of the park - Dog walkers, Walkers, families.	• Dog faeces. • Pathway erosion. • Livestock and wildlife abuse. • Litter. • Structural vandalism. • Habitat awareness (lack of).
Specialised users of the park – Canoeist/ Kayak	• Wildlife abuse. • River and abutment abuse. • Litter
Specialised users of the park - Schools and General Education	• Employee abuse. i.e. teaching. • Litter. • Livestock and wildlife abuse. • Health & Safety need.
External Stakeholders – Local Farmers	• Diffuse pollution. • Livestock nuisance – possibility for livestock to get into grounds. • BBNPA governance conflict compared to farming needs. • Boundary conflicts.
Internal Stakeholder – BBNPA sites	• Budgetary conflicts. • Resource conflicts.

Management Plan – a comparison of current habitat status

To fully critique the management plan, I have utilised site visits alongside the previous management plan commissioned in 2004, this looks at the habitat status at that time, identifying its management need, environmental monitoring and aspirational specific outcomes.

From these comparisons, it can be deemed that Craig Y Nos Country Park is in a state of partial recovery. Some of the current management proposals seem to have prospered, for instance, the Far Lake side bank repairs have brought this area back into service, this intern has alleviated the waterlogged area of Beech Wood adjacent to the lake. However, funding and the competition for funding within the BBNPA will always be a struggle, specifically with the current austerity plans from the incumbent political party running the county. Table 7 highlights historic issues with a need for further habitat management. With the need to address these specific issues, these will come at a cost. In order to support the financial burden, I have decided to investigate sustainable low carbon wastewater management.

Table 7 – Habitat issues and outcomes

Habitat Description	Historic Issues	Current Outcome
Beech Wood	• Water logged • Tree age	• Decaying woodland. • Natural regeneration requirement.
River	• Bank erosion.	• Erosion management project success. • Signs of structural erosion around old stone wall – possibly undercutting erosion. • Sustainable development of bank shoring.
Ponds & Lakes	• Water quality unknown • Silt build up • Evidence of Leaf mulch within duck pond	• Reed bed improving clarity. • Repairs to leaking structure. • Grit ponds require routine maintenance. • Evidence of grit build up in far pond. • Possible need for dredging.
Black Pine woods	• Tree age.	• Access issues.
Hay Meadow	• Invasive species • Low biodiversity	• Yellow Rattle identified. • Follow sustainable cutting need to reduce ability of Yellow Rattle Invasive Species. • Recent mixed hedge planted. • Sustainable flood alleviation. • Investigation into Castle sewerage soak away.
Parkland	• Flooding / Water log. • Ageing trees	• Fungal presence identified. • Sustainable flood alleviation.
General tree cover	• Rhododendron plantations.	• Good amount of natural regeneration • Close management.
Footpaths	• Evidence of erosion • Accessibility issues on some	• Remediation to some footpaths to improve health and safety

Future Recommendations

With continual budget constraints, I have decided to assess the current waste management at site inclusive of sewerage and food waste. I will look to quantify the cost to run the current plant and options to be a fully sustainable site that has no waste. This will reduce the impact of potential point source pollution, alongside sustainable irrigation and fertilisation of the site.

Current Wastewater Treatment Facility

Craig Y Nos current wastewater treatment facility is carried out by a package treatment plant located at the bottom of the car park. When the plant was installed around the turn of the millennium, this package process would have offered a viable financial option to an expensive connection to the sewer network (Moelants *et al.*, 2008). The package plant has been supplied by WPL Environment Wastewater Solutions company. The plant has a three-stage process as shown in Fig 5.

Stage 1 – Primary Settlement

Incoming wastewater enters the primary settlement stage where organic and inorganic matter settles (Metcalf and Eddy, 1972).

Stage 2 – Biological Filtration

Settled liquor (Primary effluent) enters the biological section where high-voidage plastic media contained within structures (biozones) encourages growth of bacteria and other organisms that treat the wastewater. This process is heavily reliant of forced air delivered by blowers (Metcalf and Eddy, 1972).

Stage 3 – Final Settlement

The treated wastewater enters the final settlement section. Here dead biomass (humus sludge) settles out within the tank. The treated wastewater is then discharged through gravity displacement to the receiving watercourse (Metcalf and Eddy, 1972).

Treatment Issues

Whilst the treatment plant is aesthetically sound, the cost to run the works and its environmental impact can be justification to rethink the Country Parks future thoughts on sustainable waste and wastewater treatment. The plant is serviced by Samatrix Pumping Systems Engineering company. The cost to run the treatment plant is estimated to be in the region of £5,000 per annum. There is also a significant power cost to run the 3.5 kW blower at site. Due to the nature of the unit, the blower must run constant all year.

Cost to run the 3.5kW blower

With an unknown cost relating to the blower, I have estimated the yearly cost utilising the following equation:

$$\text{kWh} = \text{Motor Rating} \times \text{Power Factor} \times \text{hours run} = \text{kWh/day}$$

I then multiply the cost of electricity (UK average 13.5p/kWh).

Therefore:

$$\begin{aligned} \text{kWh} &= 3.5 \times 0.8 \times 24 = 67.2 \text{ kWh/day} \\ &\times 365 = 24,528 \text{ kWh/year} \times £0.135 = £3,311.28 \end{aligned}$$

This gives an approximate total estimate to run the wastewater treatment plant of £8,311

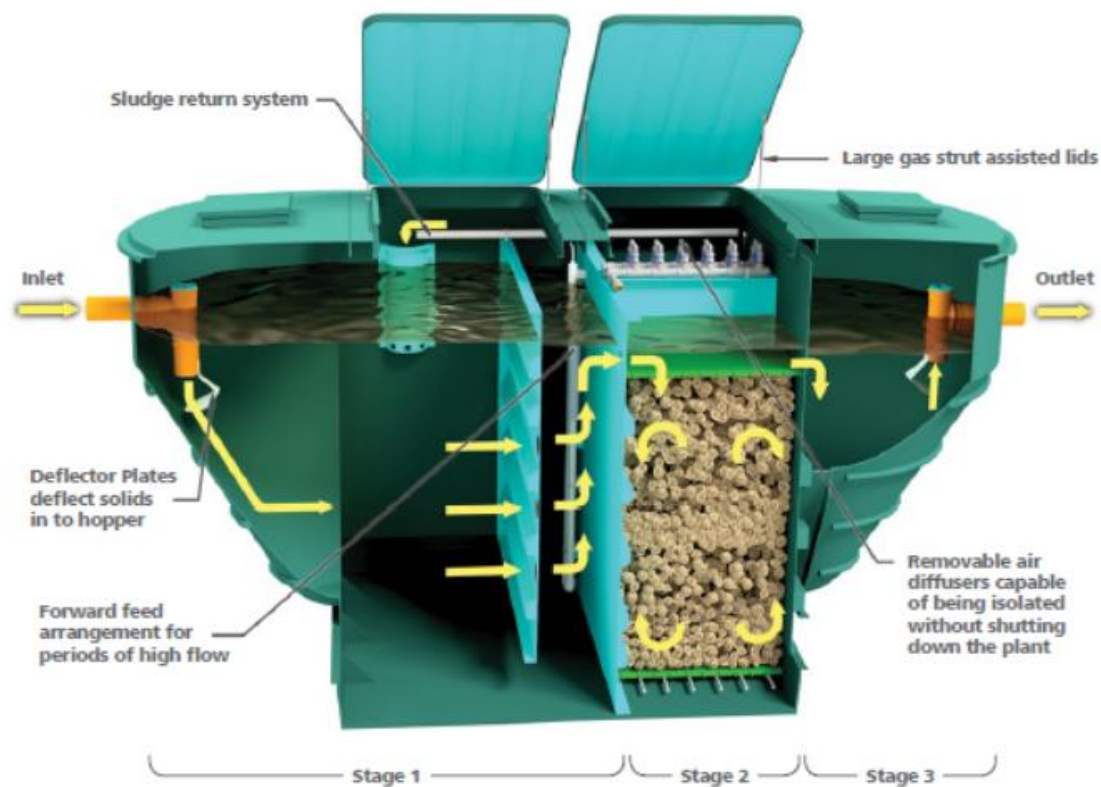


Fig 5 – Current WPL package wastewater treatment plant.

Opportunities

There is an opportunity to change the way Craig Y Nos Country Park handles both its wastewater and food waste from the café. I propose building a conventional Biological wastewater treatment facility, with a reed bed to purify the effluent. This will build biodiversity at site and enable the Country Park to utilise the effluent water when need to irrigate the site. I also propose building a small-scale worm farm to digest the organic matter created from the process, the worm farm will also digest the food waste from the café, producing a highly fertile product that the park can use in areas of poor soil condition.

Biological Filtration Wastewater Treatment Plant

Biological Wastewater Treatment in the right geology, is a low cost, low carbon solution to treating wastewater. Utilising biological trickling filters, this is a method used in wastewater treatment since J. Bailey-Denton built the first full-scale treatment works at Merthyr Tydfil in 1871 (Lofrano and Brown, 2010, Alleman, 2000). The system builds a fixed film of microbial slime (biofilm) as wastewater percolates through a semi porous media (usually blast furnace slag). Figure 6 is the basis for trickling filter design.

A horizontal settlement pre and post trickling filter would be necessary. A tertiary reed bed would also be needed. This is summarised in Fig 7. Figure 8 is a proposed worm farm.

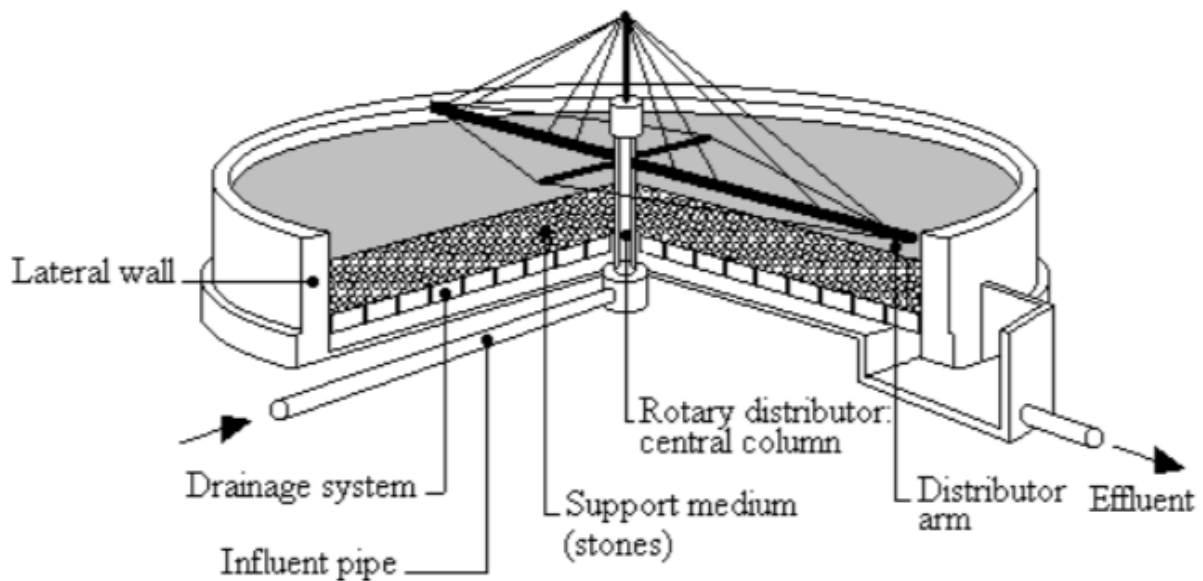


Fig 6 – Trickling Filter design

Worm Farm

The Vermistabilization of wastewater sludge and food waste enables waste to be readily converted into a vermicompost (Sinha *et al.*,2010). The earth worms remove harmful pathogens whilst mineralising essential nutrients of nitrogen, potassium and phosphorus from sludge (Sinha *et al.*,2010). This makes a super concentrated waste that through the process of aerobic composting, reduces the volume by 50% (Sinha *et al.*,2010). The ability to utilise on site or sell it could be of significant interest to the Country Park. This would also be in keeping with BBNPA vision for a sustainable future.

High Level Cost

Utilising a Unit Cost Database understanding of the proposed solution, it is deemed that potential cost to build a fully sustainable waste facility would be in the region of £80,000. These costs could be significantly reduced if relevant tradesman working within the BBNPA were used to build structures. Blast furnace slag maybe donated by Tata Steel in Port Talbot if approached, and Welsh Water design engineers could assist in scoping up the facility. Fig 9 is a high-level overview of the current wastewater treatment works within Craig Y Nos Country Park and proposed area that would be ideal for a gravity, no power facility.

Using these high-level costings, the payback in monetary terms would be 10 years.

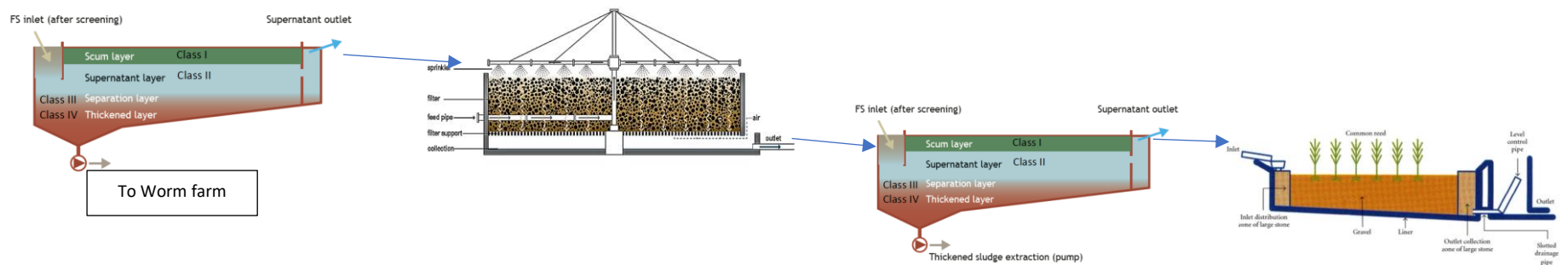


Fig 7 – Layout of conventional biological wastewater treatment works with reed bed

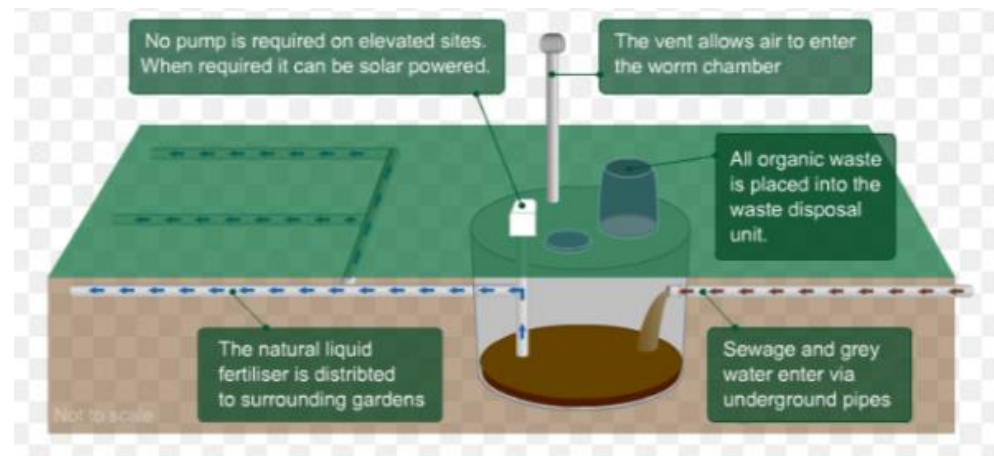
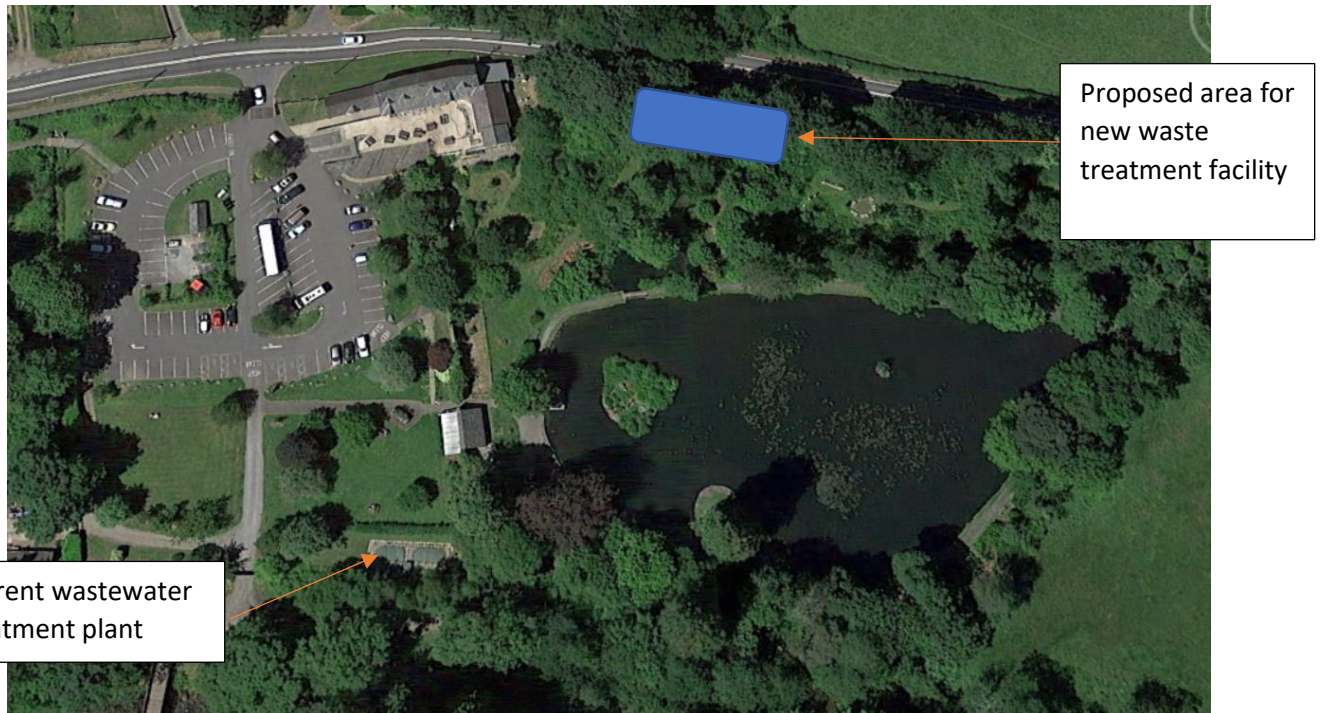


Fig 8 – Possible Worm Farm Design



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