# Case Study | Mill Stream Drive

## Local Authority:

**Calderdale Council**

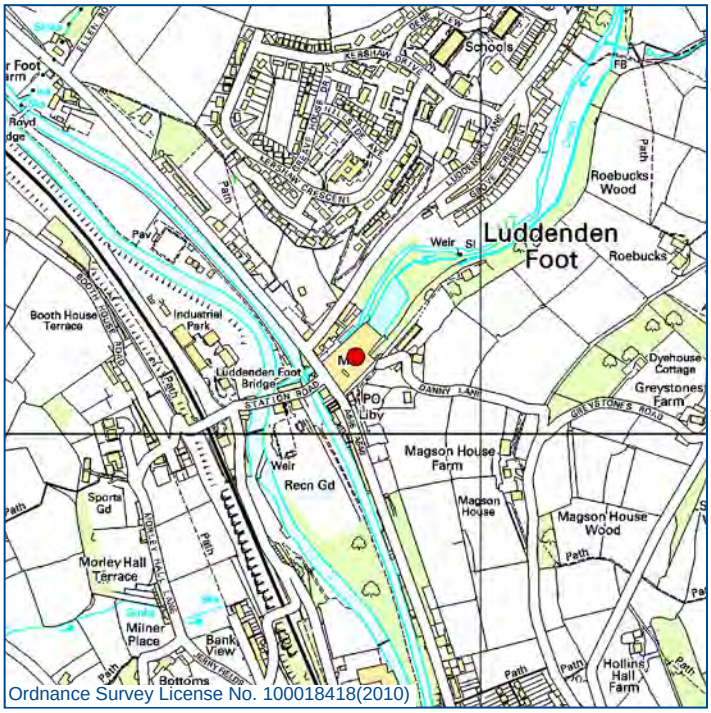
## Location:

**Mill Stream Drive, Burnley Road, Luddenden Foot, Halifax. HX2 6DE**

**OS Grid Reference: 403807, 425119**

## Development type:

**Development adjacent to water course**




**Location Plan**

## Description

Mill Stream Drive is located 5 kilometres west of Halifax town centre, on the southern outskirts of Luddenden Foot. The village of Luddenden is situated in a relatively rural location at the bottom of a narrow valley, with a mixture of agricultural land and woodland surrounding the village.

The busy A646 passes the south west of the site with the River Calder, Rochdale Canal and Caldervale railway line beyond.

The village consists of mainly traditional stone cottages, compact and enclosed by the surrounding landscape. The agricultural land surrounding the village has been designated as green belt with the land to north and east of the village also being classed as a special landscape area. The valley corridor including the entire village forms part of a wildlife corridor as set out in Calderdale's Unitary Development Plan 2002.

Mill Stream Drive is a medium-sized residential development consisting of 4 detached houses, 4 semi-detached houses, 36 two and three storey townhouses and 28 four storey apartments. Mill stream drive has been built on the former Delph Mills site, within a primary housing area. Luddenden Beck flows directly adjacent to the north west of the site and was formerly used to harvest energy from the fast flowing beck.

Phase 1 of this residential site has been completed and is now occupied. Phase 2 of the development is currently being constructed. The development is modern in appearance however natural stone has been used for the external walls with slate roofs which help the development to harmonise with the existing traditional character of the village.

**View of the development and Luddenden Brook**

## Technology

This site was specially selected as a hydropower case study due to its location adjacent to Luddenden Brook which is enclosed within a narrow channel and is likely to date back to the times of the former mill.

Both banks of the beck are developed however there is a small scrub covered area on the western bank which could be used as a plant room for a hydropower scheme.

The beck is enclosed within a concrete channel as it passes under the road bridge before it joins the River Calder.

In addition to the overview of the feasibility for the development of a hydropower scheme at this site an alternative mix of technologies has been suggested to provide a comparison.

## Development

| Buildings | No. of dwellings | Annual Gas Consumption (kWh/year) | Annual Electricity Consumption (kWh/year) |
|---|---|---|---|
| House - Detached | 4 | 38,396 | 14,540 |
| House - Semi-detached | 4 | 32,596 | 12,228 |
| House - Mid terraced | 18 | 121,032 | 48,942 |
| House - End terraced | 18 | 132,930 | 48,942 |
| Apartments | 28 | 175,168 | 61,628 |
| **Development cost** | | **£3,000,000 - £3,500,000 (2)** | |

Notes
1. Domestic consumption figures based on standard floor areas per dwelling type (Energy Savings Trust 2005).
2. Build cost based on an indicative cost of £100 per sq ft. Actual costs may vary

## Energy requirements, emissions and targets

| | | |
|---|---|---|
| **Estimated total energy requirements** | **686,402** | kWh/year |
| **Total $CO_2$ Emissions ($kgCO_2$/yr)** | **175,634** | $kgCO_2$/ year |
| **10% Renewable Energy Contribution** | **68,640** | kWhe |
| **20% Renewable Energy Contribution** | **137,280** | kWhe |

## Technology Mix Option 1 - Hydropower

| | |
|---|---|
| **Estimated annual yield (kWh) (2)** | **219,000** |
| **Estimated installed cost (£)** | **400,000-450,000 (3)** |
| **Feed in Tariff Revenue (£)** | **38,982** |
| **10% Renewable Energy Contribution** | **319** |
| **20% Renewable Energy Contribution** | **160** |

Notes
1. Assume 50kWp archimedes screw
2. Based on a capacity factor of 0.5
3. Based on installed cost of Settle Hydropower scheme
4. This technology option is for illustration only and does not guarantee that the location is suitable for this type of hydropower installation.

## Summary

Mill Stream Drive is a recently completed new build development consisting of detached, semi-detached, townhouses and apartments. The development is situated next to Luddenden Brook; a fast flowing beck immediately to the west of the development. Phase 2 of the development is currently being constructed.

The estimated energy consumption figures have been calculated using benchmark figures per dwelling type and from these the renewable energy targets have been calculated.

The primary aim of this case study is to illustrate the potential for onsite renewable electricity generation from hydropower. A 50kWp archimedes screw system has been proposed which could be capable of producing almost one third of the site's total combined energy requirements for an estimated cost of £400-450,000 and generating nearly £40,000 of revenue through the Feed in Tariff Scheme. The scheme could pay for itself in 10-12 years based solely on estimated install cost and incoming revenue.

An alternative technology mix has been suggested to show how the targets could be met by using a variety of other technologies which could cost up to £150,000 more, produce less and take longer to payback (12 to 19 years).

A centralised energy generation scheme could be installed during the initial establishment phases of the development so that necessary infrastructure, grid connection etc. could be installed with minimal disruption.

The extra over cost of integrating renewables into the development could add between 7% and 13% to the build cost which would require substantial additional upfront investment funding.

The additional upfront costs incurred need to be viewed in the longer term through the life span of the financial incentives; currently 20 years for a hydropower installation of this size.

## Technology Mix Option 2

| Renewable energy technology | Renewable energy contribution (kWh/yr) | No of dwellings | Annual Yield (kWh) | Estimated Installed Cost (£) | FIT/RHI Revenue (£) | 10% RE Contribution | 20% RE Contribution |
|---|---|---|---|---|---|---|---|
| **Solar PV (1kWp)** | 750 (1) | 35 | 26,250 | 175,000 - 262,500 (2) | 9,476 | 38 | 19 |
| **Small wind turbine (3.2kW)** | 4,655 (3) | 1 | 4,655 | 20,000 - 23,000 (4) | 1,243 | 7 | 3 |
| **GSHP - Vertical (5)** | 17,520 | 7 | 122,640 (6) | 44,800 - 84,000 (7) | 8,585 | 179 | 89 |
| **Estimated Maximum Totals** | | | **153,545** | **239,800 - 632,000** | **19,304** | **224** | **112** |

Notes
1. Assume yield of 750kWh/year per 1kWp installed (Burnley RenewEL 2005)
2. Install costs based on Burnley RenewEL 2005
3. Based on an ideal site and average wind speed of 5m/s (Proven Energy)
4. Technology cost £12,096 (Proven Energy). Installation and commissioning budget figure £10,000
5. 8kw Ground Source Heat Pump System
6. Based on domestic GSHP load factor (Towards Broad Areas for Renewable Energy Development. Report for 4NW. Arup 2008)
7. Assume vertical borehole system. Installed cost £800 - £1,500 (Energy Savings Trust)