Project: Witcher Well structural survey
Client: Mr. J. Ibison
Description: First issue
Date: 26 March 2019

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Structural survey with respect to proposed development at Witcher Well Fish Hatchery, Dunsop Bridge.

Version: 1.0 **Description:** First issue for client approval / planning submission

General notes and recommendations

A structural survey of the tank house and plant room (see below for definitions) at the former Witcher Well fish farm was carried out on the 18th March 2019 by Richard Lines. The survey was concerned with the structural aspects that were visible at the time. The structure was not dismantled, and it was assumed that the aspects visible were representative of the rest of the structure. The roof elements were inspected from ground level and the foundations were not accessible.

Any recommendations that are made are from the point of view of the author on the potential for conversion and does not make any conclusion on the economics of conversion or the likelihood of the proposals achieving planning permission or meeting current building regulations.

The tank house at the Witcher Well hatchery is very robustly built and suited to residential and commercial conversion, subject to the proposed investigations and checks detailed below:

- One or more cores are cut in the floor slab at the same location as the spring issuing through the slab to understand the source (i.e. is there a spring under the slab, or is the water intentionally piped to this location) and condition of the soil below
- A trial pit is excavated to reveal the foundation arrangement and soil conditions with respect to the proposed developments
- The in situ concrete lintel is verified for the proposed loading during structural design.

It is understood that the current roof structure will be replaced during development.

The plant room is well built and could be suited to conversion, but the size and nature of this structure mean that it is not featured in the author's understanding of the development plans. The plant room roof should be checked for asbestos prior to demolition.

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Site observations

The Witcher Well site is home to several structures, including a covered water tank, a plant room, a tank house and a larger steel portal frame building. Of interest in this survey are the tank house and the plant room, both pictured below with the tank room to the right, and the plant room to the left.

Figure 1: View up the valley, 'tank house' on the right, 'plant room' on the left

Figure 2: View down the valley, 'tank house' in the foreground, 'plant room' just visible on the right

The site is situated close to the river Dunsop part way up a slope below a dense coniferous plantation. The local BGS borehole records imply that the site is predominantly rocky glacial deposits,

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

with a sandstone / gritstone bedrock at around 20m below ground level. The site is outside of the coal mining reporting area.

The site is based around several springs, which have historically provided fresh water for fish farming activities. These springs are active and as a result the land is marshy with several species of water loving plants and grasses present. A system of channels provide drainage in these areas. It should be noted that the visit was made following an exceptionally heavy and sustained period of rain. No obvious geotechnical movement has occurred recently.

General description

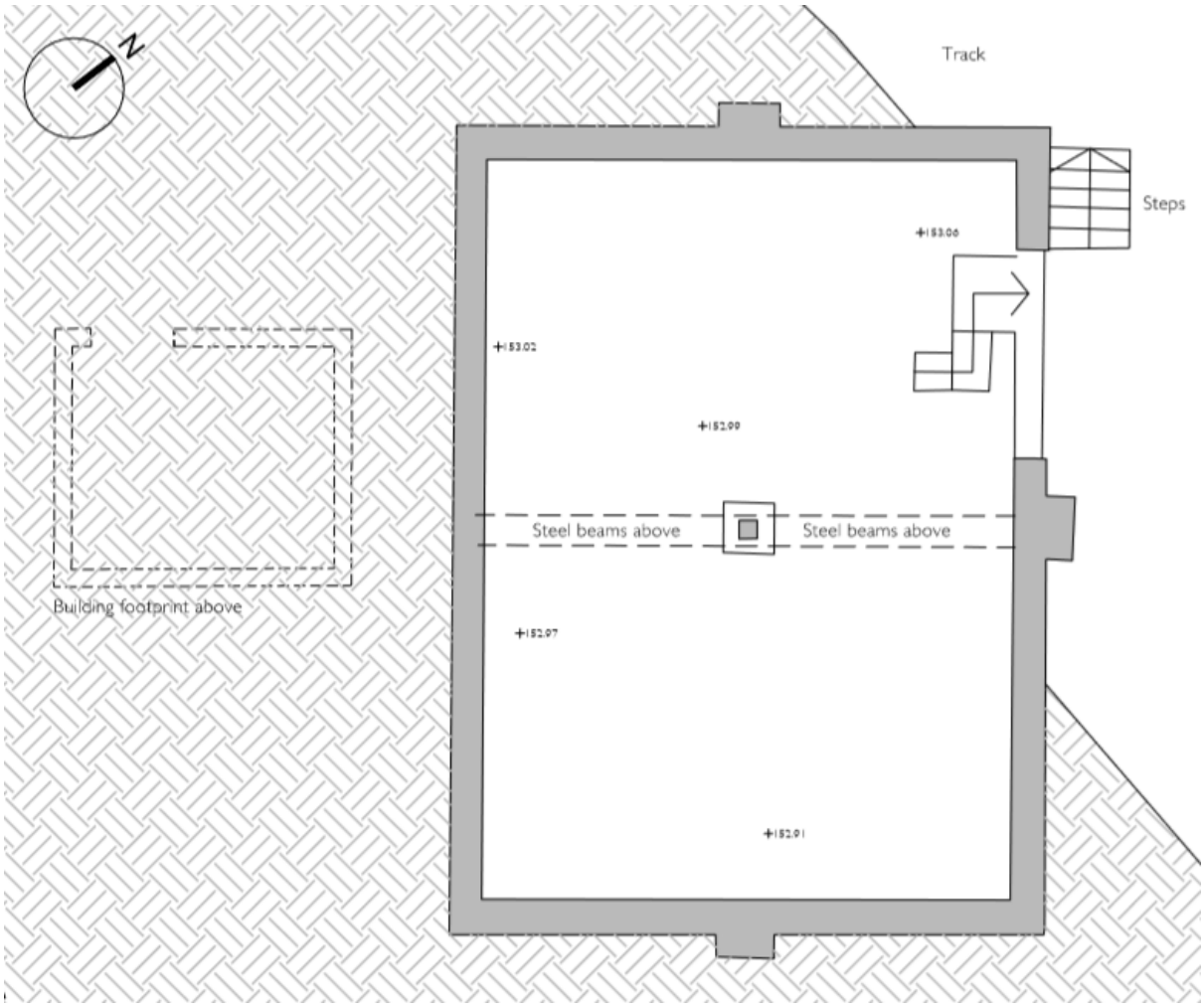

Figure 3: General layout of the tank house (right) and the plant room (left). Image provided by and courtesy of Rural Solutions Ltd.

The tank house (right in the diagram above) is a single room with substantial cast concrete walls and a lightweight corrugated steel roof, believed to be installed relatively recently. The original elements of the tank house benefit from a very robust construction, and the owner suggested that the walls and floor were originally a water retaining structure.

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

The plant room (left in the diagram above) is located immediately above the rear wall of the tank and is also a single room structure.

It is understood that the proposed developments include removing the current roof of the tank house and creating an additional floor which extends to the rear, over the current footprint of the plant room.

Figure 4: Front (north eastern) elevation of the tank house

Figure 5: North western elevation of the plant room

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Roof

Plant room

The plant room roof is a simple timber structure with a 47 x 225 softwood ridge beam supporting 47 x 100 softwood rafters at approximately 700mm centres. The roof covering is corrugated sheets on 3 No. purlins per slope. The roof sheets should be checked by a competent person for asbestos content.

Figure 6: Plant room roof layout

Tank house

The tank house roof is a later addition, constructed from a single ply of uninsulated corrugated galvanised steel sheets, supported at the external walls by a rotting timber wall plate, and down the central spine of the structure by a steel girder system, with a masonry pier mid span. The gables have been built up to match the arched profile using aggregate concrete bricks in cement mortar and with exception of the archway directly above the entrance, are well sealed.

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Figure 7: External view of tank room steel roof

Figure 8: Internal view of tank room steel roof

The central supporting steel girder is a composite unit, which appears to be constructed from two light railway rails bolted together at the required spacing through the rail web with timber packing at regular intervals. A plywood deck is fitted between the foot of the rails which supports the central gutter. The guttering may have failed, or some other means of water ingress developed since the plywood deck,

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

timber packing and steel rails are in very poor condition and showing signs of extensive rot, decay and corrosion.

Figure 9: Central girder and supporting pillar

The masonry pillar which props the girder at mid span is created by laying two clay bricks side by side in cement mortar to make a 215 x 215mm pillar. The pillar is sat on a 600 x 600 x 100mm concrete thickening/pad directly on the floor slab which is showing no signs of distress

Figure 10: Decaying plywood and timber packing in central gutter

The current roof is not part of the intended development plans.

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Walls

Plant room

The plant room masonry is in good condition, plumb within limits and shows no sign of cracking, distress or other unwanted movement.

The walls are a simple construction of 215mm thick hollow concrete blocks laid in cement mortar. The upper parts of the gables are built from concrete bricks, initially laid one brick thick for three courses above the hollow blocks, and then half a brick thick to the ridge to provide a shelf to support the ridge beam. No damp proof course was visible.

The blockwork has a cement and pebble render applied on all external elevations, which needs replacement.

The roof (and no masonry) is supported over the doorway opening by the timber wall plate, and hence no lintel is provided.

Figure 11: Masonry shelf for ridge beam bearing

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Figure 12: External render

Tank house

The walls of the tank house are of cast concrete construction, approximately 380mm (15") thick. The structure is set into the hillside, and all elevations are acting as a retaining wall to some degree. The external ground level reaches a minimum of 220mm from the bottom of the dressed stone coping at the south western corner.

The top of the walls has an unusually ornate (for a structure of this type and function) dressed sandstone coping stone around the full perimeter. This type of feature is more commonly seen on the top of a free-standing wall, indicating that the walls were built some time ago and that the original structure may not have had a roof.

Discussion with the current owner revealed that the structure is believed to have originally been a pool which was open to the air, built around the early - mid 1800s[1]. Openings in the rear wall for services etc. reveal that the walls are not reinforced, noting that reinforced concrete was invented in the mid-1800s, which adds weight to this theory as reinforced concrete is and has long been a standard construction material for a retaining structure.

The doorway opening both supports and contradicts the idea of an open-air pool. The doorway has a sawn cut on the south eastern most edge, which supports the idea that the walls were an enclosed pool, however on the opposite side, a chamfered corner is present, which appears to have been cast in place, indicating that the walls may have had an opening as part of the original design. The masonry above the doorway is supported on a 100 x 125mm concrete lintel, assumed to be of modern construction. This lintel appears to be functioning well under current loading, but should be checked during structural design for future loading.

[1] The National Library of Scotland map archives suggest that these structures were built between 1893 and 1907. License restrictions prohibit commercial reproduction of these maps, although the reader is directed to https://maps.nls.uk/view/100945478 and https://maps.nls.uk/view/125636311 for more information.

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Figure 13: LEFT: Sawn concrete at edge of door opening, RIGHT: Chamfered corner on opposite edge of door opening

The walls are plumb on average, with deviations locally of up to 30mm estimated on site. The walls also appear to have a mild batter. The local deviations are not consistent and do not appear to be related to the function of a retaining wall. The corners form the interfaces of the local deviations (deviations which may not necessarily be compatible across the corner) and there are no cracks present, indicating that there are no significant stresses associated with the differing deviations. The deviations are therefore assumed to be due to manufacturing tolerances of the formwork and shuttering used in the construction of the cast concrete walls.

There are no visible cracks in the walls (noting that there is a layer of plaster over a large proportion of the wall surface). Several openings have been made in the walls, for water drainage and services from the plant room and the nearby water storage tank. The largest hole is approx. 400mm in diameter and no evidence of reinforcing steel or the thickness of the wall at this location can be seen in this cutaway section.

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Figure 14: Closeup of opening in rear wall for water supply pipe

It is not clear whether the walls increase in thickness towards the base, in a manner consistent with a mass type retaining wall. A concrete pier is present externally on each elevation (with exception of the rear) which is likely to be a stiffening aid for the wall panel. These piers would be most effective in resisting loading coming from the inside of the structure, lending further evidence to the idea that this structure was an open pool originally.

The walls are suited to the proposed developments. The provision of a first-floor structure will also add additional restraint to the tops of the walls to assist with retaining duties. Note that the absolute strength of the walls cannot be guaranteed given that no information on dimensions, any reinforcing steel present or concrete composition are available.

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Foundations and floor

Plant room

The plant room had a solid cast concrete floor slab. The presence of any reinforcement is unknown. The floor shows no signs of distress and is currently performing well. The north western elevation has become undermined, it is not clear how this has occurred. However, the depth of the slab is visible and what appears to be concrete blocks below are also visible. This may indicate that a strip footing has been taken to a depth sufficient to avoid loading the retaining walls with the foundation surcharge. The floor slab and foundations appear to be functioning well, although are not understood to be in the proposed development plans.

Figure 15: Closeup view of exposed slab with concrete blocks underneath

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Tank house:

The foundations were not accessible or visible and therefore were not investigated. It is likely that the foundations are built into the floor slab as a one-piece cast concrete retaining structure. If the structure originally functioned as an open pool, the foundation can be assumed to be suitable for conversion due to the considerably higher loading that the liquid contents will impose as compared to a standard domestic /commercial loading. If the structure was not intended as a water retaining structure, the likely thickening at foundation level consistent with an unreinforced mass retaining wall is likely to be suitable as a foundation for the proposed developments, assuming the soil below has a reasonable bearing capacity. In any case, the suitability of the foundations and soil should be assessed by excavation of a trial pit to reveal and verify the foundations during works on site.

The floor slab is constructed from cast concrete, with a fall towards the north eastern corner, assumed to be for drainage purposes. The modern fish tanks currently in situ were supported using concrete blocks directly onto the floor slab and no evidence of cracks or other adverse reaction to this point loading is apparent.

There is a small opening in the floor structure, which is believed but not confirmed to be the source of a spring. A drainage channel has been formed in the floor slab and an exit drain(s) provided in the front (north eastern) wall. The presence of this spring is not a structural problem in its current function, although should the floor slab crack and the soil below become saturated, structural problems may arise. It is acknowledged that the soils may already be saturated if the spring is issuing immediately under the slab. Careful architectural detailing is also required to mitigate any damp issues.

A test core should be cut from the slab directly above the issuing point, to understand the source of the water flow (i.e. is it a spring, or has it been intentionally piped?) and the condition of the soil immediately below.

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Figure 16: Spring / water issue with cast in channel leading to drain in front wall

Noriker Civils Ltd.
4 Pasture Barn, Skipton Old Road, Colne, BB8 7EP
t: 07871074135 **e**: info@norikercivils.co.uk

Figure 17: Closeup of drain in front wall