Panel for Historical Engineering Works (Scottish Group) visit to East Sutherland in July 2019

RCS 16-06-19

Historical Engineering Works Visited:

(Descriptions taken from "Civil Engineering Heritage : Scotland Highlands and Islands" by Paxton and Shipway.)

- HEW 2546 NH 7494 5570 Chanonry Lighthouse.
 Designed by Alan Stevenson, built in 1846 adjacent to the pier for the ferry across the Narrows to Fort George. Tower 43 feet high.
- 2) HEW 2108 NH 7249 5626 Fortrose Harbour. Designed by Telford, trapezoidal in plan, 120 ft by 150 ft. Close to Chanonry Lighthouse.
- 3) HEW 2536 NH 6651 4761 Kessock Bridge.
 Built 1978 82 and, at that time, the largest cable-stayed bridge in Europe.
 Navigation span is 787 ft (240 m). It carries the A9 trunk road over the Kessock
 Narrows between the Beauly Firth and the Inverness Firth. Included in the design is the need to accommodate movement in the Great Glen Fault which it spans, achieved by two 394 ton hydraulic buffers at the north abutment.

4) HEW 2534 NH 6650 4620 Inverness Harbour. Construction in 1862 of the Ness Viaduct for the Ross-shire Railway cut off all the harbour upstream of the viaduct. On the West Bank is Thornbush Quay, begun in 1813 under Telford's direction, extended in 1847 under the direction of Joseph Mitchell, and a boat slipway built in 1908. Shore Street Quay was built on the East Bank after 1862 at the railway company's expense, and a new quay in1883. The harbour was expanded in 1985 by construction of 600 ft long Longman Quay lower on the East Bank.

5) HEW 0084

Caledonain Canal

- 6) HEW 0084/01 NH 6447 4674 Clachnaharry Sea-lock.
 Construction of the canal began in 1804, but construction of the sea-lock could only begin after completion of the two artificial embankments to contain the canal, 400 yards long over the mud-flats, to a 20 ft depth of water (lock sill level) at ordinary neap tides. The lock is 170 ft long by 40 ft wide.
- 7) HEW 2549 NH 6549 6951 Alness Railway Viaduct
 Joseph Mitchell 5 span viaduct for the Inverness and Ross-shire Railway, built 1862 –
 63 over the Alness River. Main spans are two segmental skew arches of 60 ft span.

- 8) HEW 2547 NH 7854 6772 Cromarty Harbour.
 Designed by John Smeaton, built 1781 to 1785, a north pier and a detached breakwater parallel to the shore. By 1839 a south pier had been built. About 1994 a timber structure connected the breakwater to the south pier, now replaced by a Bailey bridge.
- 9) HEW 0601 The Highland Railway.

replaced by the current one.

10) HEW 0132 NH 7755 9822 Fleet Mound Designed and constructed under Telford's general direction 1813 – 16 for the Marquis of Stafford (later the 1st Duke of Sutherland) husband of the Countess-Marchioness (Countess of Sutherland) to bypass the difficult passage of the Little Ferry, some three miles downstream. About 1000 yards long across the tidal mud-flats of Loch Fleet, 60 yards wide at the base and 23 feet high. At the north end where the embankment crosses the River Fleet a bridge of 4 arches each of 12 ft span was built, increased to 6 arches in 1834. On the seaward face of each arch two timber tidal flap gates were constructed which prevented sea water passing upstream at high tide and allowed river water to flow out at low tide, and so about 400 acres of land were A system of chains, pulleys and winches was devised to reclaimed for agriculture. lift the flap gates when needed, and the system was modernised in 2004.

11) HEW 2551 NH 5789 9527 Oykell Viaduct.
Built 1867, engineers were Joseph Mitchell and Murdoch Paterson, 230 ft span wrought-iron lattice girder viaduct with the deck on the top of the trusses. Built for the Sutherland Railway Company over the tidal estuary of the River. Now with pedestrian walkway attached to the west side.

12) HEW 2550 NH 6092 9154 Bonar Bridge.
This is the 3rd bridge on this site, a segmental steel tied arch of 340 ft span and 64 ft rise, designed by Crouch & Hogg, across the tidal narrows of the Kyle of Sutherland. The first bridge was of 3 arches the main one being Telford's prefabricated cast-iron lattice spandrel arch of 150 ft span, designed in 1810 and erected in 1812. There were 2 further masonry arches of 60 ft and of 50 ft spans to complete the crossing. The first bridge was destroyed in a flood in January 1892 and was replaced by a bridge of 3 bowstring steel girders of spans of 70 ft, 105 ft, and 140 ft, designed by Crouch and Hogg, and opened in July 1893. In 1973 the second bridge was

13) HEW 0258 ND 0259 1538 Helmsdale Bridge. Telford bridge of 1810 – 11 over the Helmsdale River in twin segmental masonry arches of 70 ft span. 14) HEW 2545 NH 5585 5888 Dingwall Canal
Built 1815 – 17 by the Highland Roads Commission to connect the River Peffery, the town and the Great North Road with the Cromarty Firth, used by vessels up to 9 ft draught. Suffered from silting problems and finally abandoned completely in 1884.

15) HEW 2543 NH 5399 5572 Conon Railway Bridge.Built 1862 by the Highland Railway Company, designed and built by Joseph Mitchell.Five masonry arches of 73 ft span built on a skew of 45* to the river.

Telford two-storey toll-house immediately downstream on the north side, 1830

16) HEW 1759 NH 6485 4660 Clachnaharry Swing-bridge.
Current bridge built 1909 to the same design as the original designed by Joseph Mitchell in 1862. It carries the railway over the canal on a skew of 65*. Two hog-backed wrought-iron plate girders 126 ft long pivoting on a platform built out from the east bank to give a span of 78 ft with a balancing arm of 48 ft. Painted white to limit temperature effects.

Note the distinctive clack-clack when travelling over.

17) HEW 0084 / 02 NH 6525 4559 Muirton Locks
Flight of 4 locks each 180 ft long by 40 ft wide lowers the canal 32ft from Dochfour Reach to the Muirton Basin.