HERITAGE COUNCIL OF WESTERN AUSTRALIA

REGISTER OF HERITAGE PLACES - ASSESSMENT DOCUMENTATION

11. ASSESSMENT OF CULTURAL HERITAGE SIGNIFICANCE

The criteria adopted by the Heritage Council in November 1996 have been used to determine the cultural heritage significance of the place.

PRINCIPAL AUSTRALIAN HISTORIC THEME(S)

- 3.7.3 Building and Maintaining Roads
- 3.15.3 Dealing with Hazards and Disasters

HERITAGE COUNCIL OF WESTERN AUSTRALIA THEME(S)

- 203 Road Transport
- 112 Technology and Technological Change
- 113 Natural Disasters

11. 1 AESTHETIC VALUE

Gascoyne River Bridge (fmr) has aesthetic value as a remnant span of a well-constructed structure that overcame the restrictions imposed by its isolation and extreme functional requirements with considerable elegance. (Criterion 1.1)

Gascoyne River Bridge (fmr) was a demonstration of innovative design as the first concrete and steel construction bridge in the northwest of Western Australia. The achievement was greater because of its isolation and extreme functional requirements. (Criterion 1.2)

11. 2. HISTORIC VALUE

Gascoyne River Bridge (fmr) was an important part in the establishment of the network of all-weather roads that was needed to develop the north of Western Australia, its construction was crucial in the evolution of this part of the State. (Criterion 2.1)

The construction of *Gascoyne River Bridge (fmr)* represented a shift in the design of bridges in the state. It was also a product of the period between 1926-1931 in which the State Government, through the Main Roads Board, began to organise the construction of roads and bridges within the State as a network taking over from individual Roads Boards. (Criterion 2.2)

Gascoyne River Bridge (fmr) is associated with engineer Ernie Godfrey who brought an innovative approach to the design and construction of bridges in Western Australia. *Gascoyne River Bridge (fmr)* is also associated with Charles Bunning who organised the new materials for the project and who went on to lead one of largest building supplies companies in Western Australia. (Criterion 2.3)

The construction of *Gascoyne River Bridge (fmr)* was the successful achievement of a new technical innovation in the use of steel and concrete in

the design and construction of bridges, particularly in the remote north-west region of Western Australia (Criterion 2.4)

11. 3. SCIENTIFIC VALUE

Gascoyne River Bridge (fmr) is significant in demonstrating the evolution of the technology required for the construction of permanent bridge structures over rivers subject to intense flooding. It demonstrates both the determination of the community in overcoming natural barriers to develop the Carnarvon area and also the larger Northwest Region of the State, and the high degree of technical achievement involved in assessing the natural forces and applying engineering structural design analysis to design and construct economical structures utilising concrete and steel materials (Criterion 3.1 & 3.2)

11. 4. SOCIAL VALUE

Gascoyne River Bridge (fmr) is valued by the community, as is demonstrated by the fact that it is included on the Shire of Carnarvon's Municipal Inventory of Heritage Places. (Criterion 4.1)

Gascoyne River Bridge (fmr) is valued by the community in Carnarvon and the wider community of the Gascoyne region for its associations with floods and the means of overcoming them. The regular gatherings at *Gascoyne River Bridge (fmr)* during times of floods have united the community at these difficult times. (Criterion 4.1)

Gascoyne River Bridge (fmr) contributes to the community's sense of place as it has been a crucial link for the town of Carnarvon to the rural community as well its role in linking the north west coast to the south of the State. (Criterion 4.2)

12. DEGREE OF SIGNIFICANCE

12. 1. RARITY

Gascoyne River Bridge (fmr) was the first bridge of concrete and steel construction built in the Northwest of Western Australia designed to withstand intense river flooding and provide a trafficable all-weather crossing. The three earlier concrete and steel construction bridges built in Western Australia were by WAGR over the railway at Barrack, William and Thomas Streets Perth (Criterion 5.1).

12. 2 REPRESENTATIVENESS

As the first of the three bridges that E.W.C. Godfrey designed for construction in the north-west, *Gascoyne River Bridge (fmr)* is representative of the innovative use of reinforced concrete and steel structures to span the flood prone northwest rivers. The Murchison River Bridge and the Ashburton River Bridge are the other two bridges (Criterion 6.1)

12. 3 CONDITION

The remnant span of *Gascoyne River Bridge (fmr)* is generally in good condition.

12. 4 INTEGRITY

Gascoyne River Bridge (fmr) has low integrity. As a remnant span of a traffic bridge it cannot continue to fulfil its original intended use. Nevertheless, its integrity is high as a means of interpretation of the original structure.

12. 5 AUTHENTICITY

The remnant span of *Gascoyne River Bridge (fmr)* has high authenticity. The timber railing, formed by handrail, posts and kerb, is the only original element that has not been retained.

13. SUPPORTING EVIDENCE

The supporting evidence has been compiled by Kelsall Binet Architects, with Prue Griffin, Historian (documentary evidence), and J.L. Paton, Consulting Engineer (physical evidence)

13. 1 DOCUMENTARY EVIDENCE

Gascoyne River Bridge (fmr) was completed in 1931 by the building firm of Henry Martin and Company for the Western Australian Main Roads Board. The bridge was built to provide secure vehicular crossing over the Gascoyne River, which is subject to severe flooding.

The Gascoyne River flows from east to west across the mid west of Western Australia, the mouth of the river is at Carnarvon. First permanently settled in 1876, Carnarvon was settled to serve the developing pastoral industry in the region. As coastal shipping was the only form of reliable transport a port at Carnarvon was created in 1886 to serve the Gascoyne district.[1]

By the early 1920s primary production was increasing in the state. However it was mainly confined to the south west corner of the state. The pastoral industry in the mid west and north of the state was stable in this period. [2] In 1920, canning and freezing facilities for a meatworks were built on Babbage Island adjacent to Carnarvon. The facilities were meant to supply canned beef and mutton for export but it was an ill conceived plan for a number of reasons and a local meatworks industry did not become established as was hoped for by the local community. Nevertheless, the buildings were used by the local fishermen. [3]

More successful were the new plantations of bananas, pineapples and market gardens being steadily established on the northern side of the river.[4] With its roots in the Soldier Settlement Scheme an experimental plot for tropical agriculture was reserved in 1922. The experiments were successful and land under plantation gradually grew. Associated with the development of agriculture was the arrival of Yugoslav, Italian and Czechoslovakian populations.[5]

Prior to the construction of *Gascoyne River Bridge (fmr),* crossing the Gascoyne River was achieved only during the dry season. A riverbed ford crossing consisting of wire mesh, tied and staked to the sandy river bed enabled safe

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1 *Shire of Carnarvon Municipal Inventory,* Hocking Planning and Architecture, prepared for the Shire of Carnarvon, November 2001, p. 3.

2 F. K. Crowley, *A Short History of Western Australia,* MacMillan, 1967, p. 107.

3 *Shire of Carnarvon Municipal Inventory,* Hocking Planning and Architecture, prepared for the Shire of Carnarvon, November 2001, p. 6.

4 F. K. Crowley, *A Short History of Western Australia,* MacMillan, 1967, p. 107 and *The Northern Times,* 16 April 1931, p. 2.

5 *Shire of Carnarvon Municipal Inventory,* Hocking Planning and Architecture, prepared for the Shire of Carnarvon, November 2001, p. 6

crossing at this time.[6] During the wet season, or when floods came down the river from rains further east, crossing the river was impossible. In addition the riverbed crossing was frequently washed away costing time and money to the local farmers and the local Roads Boards who teamed up to build the crossing.[7]

As the new plantations became more successful their owners joined with the pastoralists and travellers who had been demanding a bridge over the Gascoyne for some time. Road transport between towns in the north west was still not as common as coastal shipping but with the growing popularity of 'Tin Lizzies' and motor trucks, road transport was becoming more accessible and necessary as pastoralists went further inland for land.[8]

In 1927, a deputation went to Perth to request the Minister for Works, Alec McCallum, that a bridge be built over the Gascoyne River. The deputation consisted of members of the Carnarvon Municipal Council, the Gascoyne-Minilya Road Board and the Upper Gascoyne Road Board.[9] Their argument for the construction of a bridge would have been much as the local paper described.

> So far as the Gascoyne district is concerned many pastoralists, station managers and drovers will remember the heavy losses that have been entailed in connection with sheep being brought in from stations north of the river for shipment at the port of Carnarvon, through being unable to cross the river and thus losing the freight booked. ... with a view to the development of the banana, tomato, pineapple and other kindred industries ... there was always the possibility of produce being held up just as it was ready for the market.[10]

The deputation may have also pursued the line of national importance as The Northern Times did:

> The bridging of these rivers is really a national necessity, in order that there might be uninterrupted road communication between the capital of the State and the towns on the north west coast'.[11]

It is recorded that the Minister advised the deputation at the meeting that £10 000 was allocated for the construction of the bridge in the 1928-29 season and £5 000 pounds for the 1929-1930 season. Plans were also being drawn for the calling of tenders at the end of 1927.[12]

Designing of the bridge fell to the relatively new body, the Main Roads Board. Formed in 1926, the board had a huge task of designing, building and maintaining roads across the state. By the end of 1926 the Main Roads Board had set itself a five year program of works to make the roads under its control as usable as possible and integrate road construction programmes throughout the state.[13] The Main Roads Board also became responsible for

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6 Main Roads file 51/858, Part 19 Minute E.W. Godfrey 14th Feb 1930, Main Roads Department.

7 ibid.

8 F. K. Crowley, *A Short History of Western Australia*, MacMillan, 1967, p. 107.

9 Main Roads file 51/858, Part 19 Minute E.W. Godfrey 14th Feb 1930, Main Roads Department.

10 *The Northern Times*, 16 April 1931, p. 3.

11 *The Northern Times*, 16 April 1931, p. 2.

12 Main Roads file 51/858, Part 19 Minute E.W. Godfrey 14th Feb 1930, Main Roads Department.

13 Leigh Edmonds, *The Vital Link A History of Main Roads Western Australia 1925-1996*, UWA Press, Nedlands, 1996, p. 27.

the design and construction of bridges. Ernie Godfrey was appointed the first engineer in charge of the Bridge Section. Previously employed in the Victorian Railways, Godfrey came to Western Australia to head the Section in 1928.[14] Godfrey was influential for his introduction of concrete and steel into bridge design. The standard practice in Western Australia was generally to use timber as the costs were low and the material well understood.[15] The opportunity to design a bridge of concrete and steel presented itself at the Gascoyne River as the extreme floods demanded a structure that could withstand enormous stresses.[16] The bridge was designed to provide a trafficable crossing in all weathers with the roadway at a level above the estimated maximum flood.[17] The level of the bridge decking was designed to be higher than the estimated flood level but subsequent floods have gone over the *Gascoyne River Bridge (fmr).* Godfrey chose a location 8 miles from Carnarvon as the site most structurally suitable for the bridge.[18] Godfrey designed two more bridges in the north at approximately the same time that were of a similar design, the Murchison River Bridge completed in 1929 and the Ashburton River Bridge completed in 1932.[19] These three bridges represent a shift in design and techniques of bridge construction in Western Australia.[20]

Tenders were called for *Gascoyne River Bridge (fmr)* in October 1929 and interestingly the tender presented the alternatives of reinforced concrete piers or timber piers.[21] The successful tenderer was Henry Martin and Co with a price of £19 954 and it was noted that their proposal was for reinforced concrete piles and piers.[22]

Henry Martin and Co was a partnership between Charles Bunning, later to become chairman of the timber company Bunnings Ltd, and Henry Martin, a respected builder and millwright. Henry Martin was responsible for construction work and Charles Bunning undertook the surveying and supply of materials.[23]

Construction of the bridge commenced in February 1930 and it was expected that the job was to have been completed in October 1931.[24] During construction Henry Martin was the supervisor of a crew of one tradesman and approximately twenty labourers. The use of unskilled labour in this project reflects the patterns of employment on many construction sites

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14 ibid., p. 154.

15 OH 2599/46, John Gilbert Marsh, Engineer at Main Roads Department, interviewed by Leigh Edmonds, 1994.

16 OH 2599/46, John Gilbert Marsh, Engineer at Main Roads Department, interviewed by Leigh Edmonds, 1994.

17 Main Roads file 51/858, Part 19 Minute E.W. Godfrey 14th Feb 1930, Main Roads Department.

18 The distance from town has often led the bridge to be called the 9 mile bridge or sometimes more inaccurately, the 10 mile bridge.

19 Main Roads Plans No. 338 Gascoyne River Bridge, No. 400 Bridge over the Ashburton River, No. 387 over the Murchison River.

20 OH 2599/46, John Gilbert Marsh, Engineer at Main Roads Department, interviewed by Leigh Edmonds, 1994.

21 *Government Gazette*, 21 October 1929, p. 2710.

22 *Government Gazette*, 7 February 1930, p. 258 and 14 February 1930, p. 276.

23 Jenny Mills, *The Timber People, A History of Bunnings Ltd*, Bunnings Ltd, 1986, p. 93.

24 Main Roads file 51/858, Part 19 Minute E.W. Godfrey 14th Feb 1930, Main Roads Department.

during the Depression years of the 1930s.[25] The local newspaper made regular inspections to inform the community of progress of the bridge.

> ... the bed of the river presents a busy appearance as the men carry out their various duties. The piers, which are already erected give some idea of what the strength of the bridge will be when it is completed and no doubt is expressed as to its capability of withstanding the heaviest floods.[26]

Cement for the bridge was imported from the United Kingdom with the steel beams produced by BHP, their first large steel order in Western Australia.[27] The bridge was completed ahead of time in April 1931, Charles Bunning praised the workforce and stated that '(E)verything had gone without a hitch from start to finish'.[28] Invitations were extended to the local community and dignitaries to attend an opening ceremony for the bridge on 19 April 1931.[29]

The ceremony was attended by approximately 300 local people and, local and state politicians. At the conclusion of several speeches, Mr. C.J. Lewer, Chairman of the Gascoyne-Minilya Road Board, officially opened the bridge. He broke the ribbon across the bridge and drove the first car over the bridge.[30]

The event was noted in The West Australian with reference to the ease of motoring to the north, which was now becoming a more popular pastime.

> There is now a considerable stream of motor traffic from Perth to the North, and with the Murchison bridge and the Gascoyne Bridge completed it only remains for that over the Ashburton to be finished for the chief obstacles to this trip by motor to have been overcome.[31]

Since its construction *Gascoyne River Bridge (fmr)* has been subject to major river flooding in various different years. *Gascoyne River Bridge (fmr)* has been overtopped during some floods causing locals to gather to witness the event. In other years crowds would frequently gather to see whether the *Gascoyne River Bridge (fmr)* would or would not be overtopped. This occurred in 1951, 1960, 1961, 1974, 1980, 1989, 1995, 1999 and 2000.[32] The replacement of railings was a regular result of the floods.

Following the river flood of February, 1960, which reached the level of the top handrail of the bridge, Pier No. 8 slightly rotated moving 60 mm out of adjustment.[33]

Pier No. 8 again moved in the 1961 flood with the top of the pier cap moving downstream to 280 mm out of alignment with the foundation cylinder moving 6 inches downstream.[34]

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25 F. K. Crowley, *A Short History of Western Australia*, MacMillan, 1967, p. 120.

26 *The Northern Times*, 18 December 1930, p. 2.

27 Jenny Mills, *The Timber People, A History of Bunnings Ltd*, Bunnings Ltd, 1986, p. 93.

28 *The Northern Times*, 23 April 1931, p. 2.

29 *The Northern Times*, 16 April 1931, p. 2

30 *The Northern Times*, 23 April 1931, p. 2.

31 *The West Australian*, 30 April 1931, p. 15.

32 Western Infrastructure, Gascoyne River Bridge Conservation Plan, November 2000, prepared for Main Roads Western Australia.

33 Main Roads File 51-838 Part 19 Minute 16th May, 1960.

34 ibid., Minute W. Rydzewski 3rd October, 1961.

Additional strengthening of Pier No. 8 with the driving of further piles and extending the reinforced concrete pile cap was carried out in 1961.

Reinforcement of all piers was recommended by Bridge Engineer J.G. Marsh consisting of driving steel piles downstream of the piers and constructing an extended reinforced pile cap over the steel piles connecting to the existing pile caps, this work was completed in October, 1964.

In 1978 the timber kerbing was removed and an 85 mm thick mesh reinforced concrete overlay was laid on the timber decking with integral concrete kerbing.[35]

The timber railing posts were replaced with steel posts and bolted to the concrete kerbing and steel ARMCO vehicle safety guardrails bolted to the railing posts[36].

In 1988 a bitumen coating was applied to the concrete overlay[37].

Sections of the reinforced concrete decking overlay were repaired in September 2000 [38] following the flood damage in March, 2000. This included air release holes being installed to prevent further lifting of the concrete overlay.

To maintain the bridge in operational condition the following work has been recently completed.

- ü air release holes drilled through the concrete and timber decking to prevent separation of the concrete decking and timber which occurred during the floods in 2000.
- ü the tightening of deck clips connecting the timber decking planks to the top flange of the existing steel beams.
- ü the replacement of damaged guardrail posts and flexi beam panels.
- ü the installation of a reinforcing strap the full length of the kerb attached to the inside face and bolted to the existing guardrail post bolt washers to improve the strength of the guardrail system.
- ü the installation of a steel hold down strap running the full length of the deck, at the base of the upstream kerb, bolted through the concrete overlay and timber decking planks to reduce lifting effects during large river flows.

Western Infrastructure produced a Conservation Plan of the existing bridge for Main Roads WA in November 2000. This Conservation Plan outlined the requirement for additional repair work if it was to remain operational beyond the 2001/02 this work being as follows.

- ü Provide a new guardrail/pedestrian rail system.
- ü Blast clean to remove corrosion of the additional 1964 pile tops and spray with hot zinc metal to ensure continued stability of the piers under flood.
- ü Maintain the concrete overlay in a safe condition.

35 Main Roads drawing plan 7730-220-2.

36 ibid.

37 ibid.

38 Main Roads drawing 0030-0554.

ü Annual end sealing of the timber deck planks.[39]

In November 2001, *Gascoyne River Bridge (fmr)* was still used as the main traffic crossing for traffic on the North Coastal Highway. A riverbed unsealed crossing is available closer to Carnarvon for the town residents when the river is not flowing.

Subsequently, it was proposed to build a new two-lane bridge almost hard against the existing bridge, and 3.5 metres higher, as Main Roads assessed that it was no longer viable to continue repairing the original, lower bridge due to its limitations. These included it being a single lane structure that was closed regularly due to flooding with no viable alternative route. Also, there was no provision for pedestrians and it was restrictive for heavy load platforms and higher mass limit vehicles. The proposed new bridge would be located so that its centre would be about 15 m upstream of the centre of the original bridge at the southern abutment and 25m at the northern abutment. It was proposed that the embankment beside the southern abutment of the new bridge would extend under the original bridge. The original bridge would be isolated with no access roads leading to it.[40] It was proposed that this replacement bridge be constructed 3.5 metres higher than *Gascoyne River Bridge (fmr).*

Plantation owners upstream of the original and proposed bridges expressed concern that the retention of the original bridge would increase flood levels upstream. The Main Roads' assessment was that this would not be the case and it was likely that the retention of the original bridge would have only a minimal affect on flood levels.[41] It was estimated that removal of the original bridge would reduce upstream flood levels by up to 0.7 metres.[42]

Main Roads applied to demolish *Gascoyne River Bridge (fmr),* and in February 2002, this application was approved by the Development Committee of the Heritage Council of WA subject to development of an Interpretation Plan and Archival Record.

A new bridge was opened adjacent to *Gascoyne River Bridge (fmr)* on 27 July 2002. The new structure is of similar design to Godfrey's original bridge.[43] Built at a cost of $11.6 million, the new bridge was built at a higher level than old bridge and with more spacing underneath to minimise water banking up during heavy rains.[44]

In September 2002, the original bridge was demolished, with the retention of the span on the northern side, as agreed with the Heritage Council.

13. 2 PHYSICAL EVIDENCE

Gascoyne River Bridge (fmr) is located 13 kilometres north east of the Town of Carnarvon bridging the Gascoyne River at Map Grid Reference 24^0 50' N 113^0 46' E to carry the North West Coastal Highway

Form and details of the structure

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39 Western Infrastructure, Gascoyne River Bridge Conservation Plan, November 2000, prepared for Main Roads Western Australia

40 Main Roads drawing number 0030-1277, January 2001

41 Main Roads diagram *Bridge Effects on Flood Levels* produced for public display 2001

42 Main Roads, letter to HCWA 28 June 2002.

43 Tony Moulds, Insititution of Engineers (WA), letter to HCWA, 16 April 2002

44 Alannah MacTiernan MLA, Press Release, 27 July 2002.

Gascoyne River Bridge (fmr) is a remnant span of a structure 220.8 metres in overall length. The former road is set at maximum height of 7 metres above the bed of the river. The roadway width is 4.3 metres.

The original bridge comprised seventeen spans of 12 metres and two of 6 metres. The single lane roadway deck was supported on steel beams that extended between reinforced concrete piers.

The bridge was designed to provide a trafficable crossing in all weathers with the roadway at a level above the estimated maximum flood.

Gascoyne River Bridge (fmr) was set into the general flat topography of the area. The deck level of the bridge almost matched the surface level of the land on each side of the river and therefore the bridge did not require extensive abutments at the locations where it met the embankment. The remaining embankment drops almost vertically 7 metres to the river bed below. The bed of the river is dry nearly all the year with the river flowing only during periods of high rainfall. The width of the riverbed is indicative of the large seasonal flooding that takes place in the river, as is the high vegetated embankments either side of the river.

The vegetation along the river embankments consists of River Gums, Eucalyptus Camoldulensis, Limestone Wattle and shrubs Mingah Bush, Sesbania and False Mesquite.

There are two single storey buildings, including a Bushfire Brigade building, adjacent to the south east approach to the original bridge, and a single storey homestead near the north east approach.

Gascoyne River Bridge (fmr) had 18 reinforced concrete piers set into the bed of the river supporting large steel beams carrying the timber decking on which was laid the reinforced concrete roadway with a bitumen coating.

Each of the bridge piers was directly supported on two pile groups. Each pile group comprised three 355 mm square reinforced concrete piles driven 6.100 m into the bed of the river.

Each reinforced concrete pier consisted of a pile group topped with a 1.5 m diameter pile head that extended into a facetted tapered column supporting an integral horizontal crosshead. There was a diaphragm wall between the tapered columns that formed the outer edges of each pier.

The tapered columns were connected by a 230 mm reinforced concrete diaphragm wall which, at its head, connected with the 590 mm deep and 1.675 mm wide reinforced concrete crossheads that spanned the tops of the two columns at each pier .

The timber road deck was supported by steel beams that were carried by the piers.

The four 610 mm deep by 175 mm wide steel beams were born on packing and were bolted to the top of the reinforced concrete crosshead at each pier.

The transverse timber decking consisted of 150 mm deep by 230 mm wide timber planks clipped to the supporting steel beams. The original decking remains on the remnant span.

The timber decking which formed the original road surface has been topped with an 85 mm deep mesh reinforced concrete overlay with a bitumen topping.

Spikes driven into the timber decking provide connection between the timber decking and the concrete overlay.

Formed concrete kerbs were an integral part of the concrete overlay to which the handrail posts were bolted. The railing on either side of the roadway was supported on steel posts carrying an ARMCO steel guardrail. There was provision to remove the railing prior to predicted flooding. Sections of the guard railing of the original bridge were out of alignment at the time of assessment due to the movement of Pier No. 8 that took place in the 1960s.

The concrete roadway of the original bridge was damaged by the 2000 flooding indicated by evidence of recent repair to the concrete surface noted prior to demolition.

At riverbed level the original pile heads were strengthened on the downstream side by the addition of four 9 m, 250 mm by 200 mm steel rolled steel joists driven as additional piles. A 750 mm reinforced concrete pile cap was cast over these piles and connected to the original pile heads.

At Pier No. 8 four additional concrete piles were driven at each of the pile groups and a 750 mm reinforced concrete pile cap cast over these piles and around the original pile heads.

A 450mm diameter steel pipeline was located on the upstream side of the bridge at the same level as the steel bridge beams. It is understood that the pipeline was installed as a replacement for the previous pipe line which had been located at riverbed level and had been washed away during the year 2000 floods.

Appearance and condition of the building to date.

Jim Paton inspected *Gascoyne River Bridge (fmr)* on 23rd November, 2001. The inspection was followed by a meeting with Mr. Neil Westlake at Main Roads Gascoyne Regional office in Carnarvon and a discussion with J. Erceg, Regional Manager.

The bridge appeared to be in good condition particularly the main structure of the piers and steel beams.

The inspection in November 2001 showed that the original concrete from the bridge construction, utilising local river sand and aggregate, was in excellent condition with no visible signs of repair being evident.

Note: In September 2002, the original bridge was demolished, with the retention of the span on the northern side, as agreed with the Heritage Council.

13. 3 COMPARATIVE INFORMATION

E.W.C. Godfrey joined Main Roads of Western Australia in March 1928 and was made responsible for the specialist bridge section. Throughout his career Godfrey displayed the capacity to embrace advanced design practice evident in the design of the Causeway (1952) and Narrows Bridge (1959) over the Swan River at Perth. In his career he was also responsible for the design and construction of the traffic bridges at North Fremantle and Canning River, and in wartime the construction of the Western Australia section of the East West road crossing.[45]

History of the Main Roads Department of Western Australia from 1926 to 1956 lists three important North West Bridges as having been constructed in

45 Tony Moulds, Insititution of Engineers (WA), letter to HCWA, 16 April 2002

the 1929 to 1931 period[46]: *Gascoyne River Bridge (fmr),* Murchison River Bridge, and Ashburton River Bridge.

Murchison River Bridge (no. 837)

This bridge, completed in 1929, is located near Billabilong Homestead, 120 km north of Mullewa. It is 240 feet (73.2m) long and 14 feet 8 inches (4.5m) wide, an integral reinforced concrete structure with portal frame pier design and continuous reinforced concrete beam and slab design. Murchison River Bridge was designed by E.W. Godfrey, and constructed by Henry Martin & Company at a cost of £9400, over a period of 14 months, with interruptions caused by floods.

Ashburton River Bridge/ Minderoo Bridge (no. 400)

The bridge over the Ashburton River on the North West Coastal Highway. Was completed in May 1932. It measured 243 feet (74.1m) long and 14 feet (4.3m) wide. The bridge was constructed of reinforced concrete foundations and steel piers, with steel support beams and timber decking. This was also an E.W. Godfrey design, and was constructed by contractors Messrs L.F. Atkins and E.A. Gorham. Construction took 31 months, at a cost of £1,957.

These single lane bridges, together with *Gascoyne River Bridge (fmr),* are radically different in design to each other, but each represents an excellent command of structural engineering design and the introduction of reinforced concrete and steel structures, a distinct departure from previous bridges, although necessary for the flood prone Northwest rivers.

The Heritage Council database lists a number of other concrete construction road bridges from various periods in the twentieth century, including Fortescue River/Roy Hill Road Bridge, at Nullagine (c1928), which the Shire of East Pilbara Municipal Inventory suggests may also be a Godfrey-designed structure. It is a single-lane bridge with concrete piles, steel rails, and footings including local stone. While no length is given in the MI information, photographs show that it is clearly much shorter than *Gascoyne River Bridge (fmr).*

Other Northwest concrete construction road bridges in the Heritage Council database are Hutt River Road Bridge (no date), Murchison Bridges, Northwest Coastal Highway, Northampton (1950) and Fitzroy Crossing Bridge (1974), for which detailed information has not been located.

13. 4 REFERENCES

Gascoyne River Bridge Conservation Plan prepared by Western Infrastructure for the Main Roads Department of Western Australia, November 2000.

13. 5 FURTHER RESEARCH

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[46] History of the Main Roads Department of Western Australia from 1926 to 1956 - M. Glendinning 1956