PRELIMINARY DESIGN REPORT

for

THE CONSTRUCTION OF A TEMPORARY

BRIDGE OVER NETLA RIVER

ON kM 138.2

LIARD HIGHWAY

NORTHWEST TERRITORIES

NOVEMBER, 1978

ASSOCIATED
ENGINEERING
SERVICES LTD.

AESL

Government of Canada | Gouvernement du Canada

MEMORANDUM NOTE DE SERVICE

Mr. F. Janz
Head
Field Engineering Services
Transportation Div., E.A.B.
D.I.A.N.D.
Edmonton

G D Reid

6220-A1-1
1240-7-11

Public Works Canada
Western Region

1979-01-12

TEMPORARY BRIDGE(S), NETLA RIVER, LIARD HIGHWAY
KM 138.2, N.W.T.

As requested by your department, Associated Engineering Services Limited of Edmonton have prepared a report on "the Construction of a Temporary Bridge over Netla River." (Copy attached). You will note that AESL recommend a two span structure using sawn treated local timber for the substructure and steel girders or Acrow/Bailey members for the super-structure with treated timber decks at costs of $300,000 and $550,000 respectively. As stated in their summary (page 17) they do not consider that local unsawn/untreated timber could be used to construct a complete bridge i.e. used for all structure components.

We recommend for your consideration, the twin steel girder design (see fig. 2) with:

- pentachlorophenol treated unsawn local timber substructure (rock filled)
- 2 spans, 27.5 metres each
- treated, sawn timber deck and rails
- at an elevation adequate for the passage of a 1:50 flow ($480m^3$/sec)
- HS 25 loading, "one way" width on an offset alignment
- a capital cost of $300,000 being about 1/3 the cost of a permanent structure
- changing the upstream and downstream faces of the pier to a 90^0 'pointed' shape (add $10,000)
- changing the under pier 'stone' foundation placement to 1 to 1 side slopes. (add $15,000)
- a probable total capital cost of $325,000 with incorporated changes as recommended

In the event that the above recommended structure does not adequately meet with your socio-economic objectives of developing a bridge using local untreated, unsawn, timber for the entire structure and a higher input of local resident labor, we should explore the possibility of specifying that an 'adjacent' grading contractor be required to install such a bridge for his own use and allow it to remain for future public use. Such 'contractor-conceived' - constructed structures could also be considered for two or three other stream crossings south of the Netla. The choice of such other streams is not really possible at this time since we are still considering alternate locations of certain highway sections. You will note that it is becoming increasingly obvious that an 'engineered' fully local timber structure is extremely difficult to attain due to the unknown strength properties of the local timber, and the less-than-desireable length/diameter dimensions of the local timber.

N.A. Huculak
Regional Highways
Engineer

Attach.

DISTRIBUTION LIST

Mr. A. Redshaw
Regional Manager
Water Resources Division
Department of Indian and
Northern Affairs
P.O. Box 1500
Yellowknife, N.W.T.
X1A 2R3
(2 copies)

Mr. J. Ganske
Regional Manager
Land Resources Division
Department of Indian and
Northern Affairs
P.O. Box 1500
Yellowknife, N.W.T.
X1A 2R3
(3 copies)

Mr. G. McKinnon, Chairman
Regional Transportation Committee
Department of Fisheries and Environment
501 University Crescent
Winnipeg, Manitoba
(6 copies)

Mr. J. Bentley, Chief
Highways Division
Department of Public Works
Government of the Northwest Territoties
Yellowknife, N.W.T.
X1A 2L9
(1 copy)

Mr. G.D. Reid
Director
Transportation Program
Design and Construction
Public Works Canada
Ottawa, Ontario
(6 copies)

Mr. C.H. Yurchak, Edmonton
(1 copy)

Mr. K. Barnett, Edmonton
(1copy)

Mr. E. Viddal, Edmonton
(1 copy)

TABLE OF CONTENTS

1.0 INTRODUCTION

On Sept 26, 1978 AESL was requested by Public Works Canada to prepare a study and preliminary design report for the construction of a temporary bridge over the Netla River on the Liard Highway in the Northwest Territories. The temporary bridge is to have a low capital cost, carry roadway traffic safely, have a service life of about 5 years, and be constructed using as much local labour and materials as possible.

The following bridge types including estimated costs were to be investigated:

1. A temporary bridge offset from the permanent roadway centerline a distance sufficient to prevent interference with the permanent structure.

   (a) A bridge utilizing local native timber
   (b) A bridge having a bailey truss superstructure

2. A temporary bridge having the same vertical and horizontal alignment and roadway width as the proposed permanent structure for the Netla River Crossing.

3. Any other temporary structure types that are economic and conform to the alignments described in (1) and (2).

This report is supplementary to a previous report prepared by AESL for the preliminary design of a permanent structure at the Netla River Site. Three possible alternatives were examined on an offset alignment from the permanent roadway alignment. Two alternates were considered for a temporary structure located on the permanent alignment. Cost estimates and recommendations are developed for each alternate.

2.0 SERVICE LIFE

Although intended to have a 5 year useful life it is AESL's opinion that the temporary structure will be required for the five year period and may be required to serve as long as 10 to 15 years. The need for replacing the temporary structure with a permanent one can be assessed on an annual basis and is dependent on the nature and volume of Highway traffic as well as the condition of the temporary structure.

3.0 GENERAL REQUIREMENTS

3.1 Bridge on Offset Alignment

Since the structure is intended to serve on a temporary basis a lower speed limit in the vicinity of the bridge and a lower standard of site geometrics is acceptable. Therefore the horizontal and vertical alignment for the bridge approaches will be sub-standard and the bridge will be designed to carry single lane traffic in order to lower costs.

The structure will be designed to accommodate the estimated design flows for the Netla River as determined by Unies Ltd, Winnipeg. It is proposed that the temporary bridge be designed to accommodate the 1 in 50 flow although a review of a low level bridge will be investigated since disruptions to traffic for short periods during peak flows are expected to be tolerable. The concept is consistent with a lower standard of service associated with a temporary structure.

The bridge should have a strength equal to the other permanent bridges between Fort Liard and Fort Simpson and will therefore be designed to support HS25 live loading.

The construction of the bridge must avoid damage to the environment in accordance with the guidelines outlined in the Synergy West Ltd. report dated May, 1975.

3.2 Bridge on Permanent Alignment

The temporary bridge on the permanent roadway alignment will conform to all the requirements including (1) approach roadway geometrics (2) bridge width, (3) deck elevation (4) design discharge (5) live loading and (6) environmental impact described in the Preliminary design report for the Netla crossing previously prepared by AESL.

4.0 SELECTION OF MATERIALS AND STRUCTURE TYPE

4.1 Materials

Local timber in the form of 400 mm butt diameter white spruce trees is available in the area surrounding the site. Inquiries with lumber mills in the area indicates that the largest size lumber ranges between 75 mm x 300 mm x 7.3 m long and 250 mm x 250 mm x 6 m long and is cut from 400 mm butt diameter spruce trees similar to trees adjacent to the site.

Rock for the timber cribs and rip rap will be available from roadway cut sections between km 177 and km 180 or about 40 km distant from the bridge site. It is proposed that the mass of the rock stones range between 11 and 45 kg.

4.2 Sawn Timber

It is proposed that sawn timber be used for all the bridge timber rather than timber in log form. For the timber in the substructure, sawn timber can be dipped in preservative in order to resist decay whereas timber in log form is not receptive to treatment by dipping and therefore has a much shorter service life. In the case of the timber for the bridge deck sawn timber is essential for framing purposes.

4.2 Sawn Timber, contd.

Cost, availability of equipment, as well as the project time schedule will determine whether the timber will be sawn using local labour or purchased from suppliers in nearby Fort Nelson. Preliminary work indicates that the most practical approach from a cost and schedule point of view is to purchase the timber from local suppliers. "using as much local labour and materials as possible"

4.3 Effect Of Treatment On Timber Service Life

The treatment of timber with preservatives that are toxic to fungii causing decay in timber increases the service life of the material between 1 to 6 times the service life of comparable untreated material.

A comparison of alternate material types indicates that the service life of the timber material will govern the life of the temporary bridge and for wet service conditions the service life is estimated as shown in Table 1.

TABLE 1

ESTIMATED SERVICE LIFE OF WHITE SPRUCE

WET SERVICE CONDITIONS

	TREATMENT PROCESS	ESTIMATED SERVICE LIFE
1.	Untreated air dried sawn lumber or logs	4 to 8 years
2.	Air or kiln dried lumber, dipped in Pentachorophenol	8 to 15 years
3.	Pressure treated in accordance with CSA 080	15 to 30 years

4.3 Effect Of Treatment On Timber Service Life, contd.

A review of the estimated service life values in Table 1 indicates that the practical alternative in terms of service life as well as cost is to treat the material by dipping in pentachlorophenol. The pressure treated material requires that the material be transported from Southern B C or Alberta since specialized equipment required for treatment is not available in the North and therefore this alternative is uneconomic. The use of untreated material in our opinion does not justify the 1% to 2% saving in overall project cost. In conclusion, air or kiln dried dip treated sawn lumber appears to be the most economic and practical material to use for the bridge.

4.4 Substructure

A preliminary review of the pier height and estimated ice forces indicates that sway-braced timber or steel piles do not have the rigidity or strength to be used for the piers and accordingly the pile alternative for the substructure was not pursued any further. Alternatively, the size of local timber is suitable for the construction of rock filled timber cribs and therefore timber crib piers and abutments are proposed for the substructure.

4.5 Superstructure

A review of the minimum bridge clear span requirements which includes estimated ice floe sizes and tree lengths indicates that a 9 m minimum clear opening between piers is desirable. A review of the pier crib height indicates that 3 m wide cribs are necessary for pier crib stability. Therefore, minimum span lengths in the order of 12 m are required for the crossing.

4.5 Superstructure, contd.

Since it is economically desirable to use as much timber as possible, 75 mm x 300 mm x 7.3 m long timber pieces laid on edge and nailed together are a logical choice for a superstructure system. However, it was found that the 7.3 m long pieces are too short to meet the minimum clear span requirements since a 7.3 m less 3 m wide pier crib yield a clear span of 4.3 m. Such a short span arrangement would require twelve 3 m wide piers which adds about 36 m to the total bridge length in order to provide the flow area necessary to accommodate the design discharge. When all the above factors were considered it was concluded that the short span arrangement was uneconomic as well as impractical and was not pursued any further.

A preliminary comparison of pier crib versus superstructure cost indicates that spans ranging between 15 m and 27 m are economic. Therefore it is proposed that steel girder or Bailey trusses be used for the temporary bridge main members since the steel members are economic for the above span range. It is also proposed that laminated timber be used for the bridge deck since the timber appears to be the most economic and is labour intensive.

5.0 BRIDGE ON OFFSET ALIGNMENT

It is proposed that the temporary structure be situated about 40 m upstream of the permanent roadway alignment as shown on Fig. 1. As shown on Fig. 1 the temporary structure crosses the river channel at right angles in order to avoid ice forces acting on the long dimension of the river piers.

5.1 Alternate Bridge Vertical Alignments

Two alternative vertical alignments were reviewed for the temporary structure. The first or "high level" alignment is identical to the alignment for the permanent structure and is shown in Fig. 2 and 3.

5.1 Alternate Bridge Vertical Alignments, contd.

The second or "low level" alignment has a deck elevation that is 1.2 m lower and has a 6 m shorter bridge length than the "high level" alignment and is shown on Fig. 4. The "low level" alignment can accommodate the 1 in 50 flow however the freeboard allowance is only 0.3 m which in our opinion is the lowest value that is acceptable. The low level bridge alignment will be more economic because of the shorter structure and lower approach embankments however, the low level bridge is vulnerable to flood damage during high flows. Therefore, it is proposed that for the "low level" alternate the roadway east of the bridge be constructed to a lower elevation than the bridge deck so that during periods of flood excess flow would cross the road thereby preventing the bridge from washing out.

5.2 Alternate I

The alternate I "high level" arrangement consists of 2 spans @ 27.5 m for a total bridge length of 55 m with one pier in the middle of the river channel as shown on Fig. 2. A detailed description of the substructure and superstructure is provided below.

Substructure

The pier consists of 3 m wide x 9 m long x 8.5 m high rock filled timber cribs supported on a 3 m deep rock filled foundation. The abutments consist of 3 m wide x 9 m long x 4.8 m high rock filled timber cribs, supported on a compacted granular foundation. All the cribs would be constructed with 200 mm x 200 mm rough sawn treated timber pieces.

Each spill through slope would be protected by stone rip rap. It is proposed that the mass of the rip rap stones would range between 11 and 45 kg.

Superstructure

Two superstructure types each having two 27.5 m span lengths were investigated and are described below:

(a) Steel I-Girders with timber deck

A twin 1100 mm deep I-girder system supporting a 50 mm x 300 mm deep laminated timber deck was investigated and is shown on Fig 2. All the timber is local white spruce treated with pentachlorophenol. A cost estimate for Alternate I including the Steel I-Girders is provided below:

Superstructure	$ 140,000
Substructure	$ 110,000
Rip Rap	$ 15,000
Sub Total	$ 265,000
Contingency Allowance	$ 20,000
Engineering Excluding on-site inspection	$ 15,000
TOTAL ESTIMATED COST	$ 300,000

(b) Acrow-Bailey Truss Bridge

An Acrow-Bailey Double Single reinforced truss arrangement having a standard width deck as shown on Fig. 2 was investigated for the temporary crossing. The timber deck consists of 75 mm x 250 mm treated white spruce planking. A cost estimate for Alternate I with the Acrow-Bailey truss system is provided below:

Superstructure	$ 185,000
Sub-structure	$ 110,000
Rip Rap	$ 15,000
Sub Total	$ 310,000

5.2 Alternate I contd.

(b) Acrow-Bailey Truss Bridge, contd.

Contingency Allowance	$ 20,000
Engineering Excluding on-site inspection	$ 15,000
TOTAL COST	$ 345,000

The structural steel girder bridge, with the exception of supply, delivery and erection of the structural steel girders, can be constructed by a local contractor using local materials and labour. For the Acrow-Bailey truss alternate the truss members would be supplied by others, but can be assembled and launched by a local contractor with the help of an advisor provided by the truss supplier.

A comparison of the steel girder and truss superstructure cost estimates indicates that the steel girder bridge cost is about 15% lower than the cost for a truss superstructure.

5.3 Alternate II

The Alternate II "high level" arrangement consists of 3 spans @ 19.30 m for a total bridge length of 58 m with two piers in the river channel as shown on Fig. 3. The bridge was lengthened by 3 m in order to account for one additional pier in the river channel thus maintaining a flow area identical to the two span arrangement which has one less pier in the river channel. A description of the substructure and superstructure is provided below:

Substructure

The piers and abutments are basically as described in Alternate I.

5.3 Alternate II, contd.

Superstructure

Two superstructure types each having three 19.30 m span lengths were investigated and are described below:

(a) Steel I-Girder with timber deck

A twin 900 mm deep I-girder system supporting a 300 mm deep laminated timber deck was designed and is shown on Fig. 3. All the deck timber is 50 mm x 300 mm treated local white spruce. A cost estimate for the steel girder and timber deck system in the Alternate II arrangement is provided below:

(a) Steel I-Girder with timber deck, contd.

Superstructure	$ 120,000
Substructure	$ 160,000
Rip Rap	$ 15,000
Sub Total	$ 295,000
Contingency Allowance	$ 20,000
Engineering Excluding on-site inspection	$ 15,000
TOTAL ESTIMATED COST	$ 330,000

(b) Acrow-Bailey Truss Bridge

An Acrow-Bailey Double Single truss arrangement having a standard width deck as shown on Fig. 3 was investigated for the temporary crossing. The truss floor is covered with 75 mm x 250 mm treated white spruce planking. A cost estimate for the Alternate II arrangement with the Acrow-Bailey truss system is provided below:

5.3 Alternate II, contd.

Superstructure	$ 160,000
Substructure	$ 160,000
Rip Rap	$ 15,000
Sub Total	$ 335,000
Contingency Allowance	$ 20,000
Engineering Excluding on-site inspection	$ 15,000
TOTAL ESTIMATED COST	$ 370,000

As described earlier the steel girder and timber deck bridge except for the supply and erection of the steel girders, can be constructed by a local contractor using local labour. The Acrow-Bailey truss alternate requires the purchase of the truss members and can be constructed and erected by a local contractor using local labour with the support of an advisor provided by the truss supplier. A local contractor can be used to construct the substructure.

A comparison of the Steel girder and Acrow-Bailey truss superstructure alternates indicates that the Steel girder superstructure has an estimated cost that is 12% lower than the Acrow-Bailey truss superstructure. A comparison of the Steel I-girder bridge types in Alternates I and II indicates that the two span arrangment in Alternate I costs $300,000 versus $330,000 for the Alternate II three span arrangement or $30,000 less. The cost differential is attributed to the cost of one additional pier and a 3 m longer bridge in Alternate II exceeding the cost of the longer span girders in Alternate I.

5.4 Alternate III

The Alternate III "low level" arrangement consists of two spans @ 24.5 m for a total bridge length of 49 m with one pier in the river channel and a low level east approach as shown on Fig. 4. A description of the substructure and superstructure is provided below.

Substructure

The pier and abutments are basically as described in Alternate I.

Superstructure

Two superstructure types each having two 24.5 m span lengths were investigated and are described below:

(a) Steel I-girder with timber deck

A twin 900 mm I-girder system supporting a 300 mm deep laminated timber deck was designed and is shown on Fig. 4. A cost estimate for the steel girder and timber deck system in the Alternate III arrangement is provided below:

Superstructure	$ 120,000
Substructure	$ 100,000
Rip Rap	$ 15,000
Sub Total	$ 235,000
Contingency Allowance	$ 20,000
Engineering Excluding on-site inspection	$ 15,000
TOTAL ESTIMATED COST	$ 270,000

(b) Acros-Bailey Truss

An Acrow-Bailey Double Single Reinforced truss arrangement having a standard width deck was investigated for the Alternate III arrangement and is shown on Fig. 4. A cost estimate for Acrow-Bailey system in the Alternate III arrangement is provided below:

5.4 Alternate III, contd.

Superstructure	$ 170,000
Substructure	$ 100,000
Rip Rap	$ 15,000
Sub Total	$ 285,000
Contingency Allowance	$ 20,000
Engineering Excluding on-site inspection	$ 15,000
TOTAL ESTIMATED COST	$ 320,000

The estimated costs indicate the steel girder superstructure is more economic as compared to the Acrow-Bailey truss arrangement.

5.5 Cost Summary-Bridge on Offset Alignment

A summary of estimated costs for Alternates I to III respectively is shown on Table 2 below and include the cost of the structure, rip rap and the spill through slope enbankment plus a contingency allowance and design engineering. However the estimated cost of the approach roadway embankment adjacent to the bridge is not included in the bridge cost and amounts to about $20,000 for a 100 m long section of roadway at each end of the temporary structure.

Table 2

SUMMARY - BRIDGE ON OFFSET ALIGNMENT

Description	Superstructure Type	Total Estimated Bridge Cost
Alt.I: high level	Steel Girder	$300,000
two span	Bailey truss	$345,000
Alt. II: high level	Steel Girder	$330,000
three span	Bailey truss	$370,000

5.5 Cost Summary-Bridge on Offset Alignment, contd.

Alt. III: low level	Steel Girder	$270,000
two span	Bailey truss	$320,000

A comparison of the most economic Alternate III and Alternate I Steel I-girder bridge arrangements indicates an estimated saving of $30,000 in favour of the Alternate III arrangement because of the overall shorter bridge length which is 49 m and 55 m for the Alternate III and I arrangements respectively. There should be an additional saving of about $3,000 in favour of the low level Alternate III arrangement over the high level arrangements attributed to a lower approach embankment. However, the combined bridge and embankment estimated saving is only 11% of the overall Alternate I bridge cost and is therefore, in our opinion, not worth the higher risk of structural damage during high flows.

5.6 Estimated On-site Labour Requirements

The construction of the temporary single lane bridge is estimated to require a total of 10 to 12 men. Six to eight men could be local unskilled labour and the remaining four men would be skilled in the operation of heavy equipment as well as direct operations. It is estimated that the bridge can be completed in a period ranging between 16 to 20 weeks.

6.0 BRIDGE ON PERMANENT ALIGNMENT

Two alternate span arrangements situated on the proposed roadway alignment having the same vertical alignment as the proposed permanent bridge were investigated. The first or Alternate IV arrangement is a two span structure having one rock filled crib pier in the river channel and the second or Alternate V arrangement is a three span structure having two rock filled crib piers in the river channel. The Alternate IV arrangement is shown on Fig. 5 and a description of the two alternates including estimated costs provided below.

6.1 Alternate IV

The Alternate IV bridge arrangement consists of a two span structure having equal 27.5 m span lengths for a total bridge length of 55 m and a roadway width of 9.75 m.

The substructure consists of a 3 m wide x 11 m long rock filled timber crib pier and 3 m wide x 11 m long x 4.8 m deep rock filled timber crib abutment. In addition a gabion retaining wall for each abutment wing wall is proposed as shown on Fig. 5. The sub structure foundation consists of a rock base for the pier and a compacted granular base for the abutments. Each spill through slope is protected by rip rap as shown on Fig. 5.

The superstructure consists of a 250 mm deep laminated timber deck supported on five steel I-beams as shown on the cross section in Fig. 5. A cost estimate for the Alternate IV arrangement is provided below.

Superstructure	\$ 330,000
Substructure	\$ 130,000
Rip Rap	\$ 30,000
Sub Total	\$ 500,000
Contingency Allowance	\$ 30,000
Engineering Excluding on-site inspection	\$ 20,000
TOTAL ESTIMATED COST	\$ 550,000

6.2 Alternate V

The Alternate V bridge arrangement consists of a three span structure having equal 19.3 m span lengths for a total bridge length of 58 m.

6.2 Alternate V, contd.

The substructure and superstructure components are identical to the two span arrangement except for the superstructure I-beams which are not as deep and heavy as in the two span arrangement. A cost estimate for the Alternate V arrangement is shown below:

Superstructure	$ 280,000
Substructure	$ 205,000
Rip Rap	$ 30,000
Sub Total	$ 515,000
Contingency Allowance	$ 30,000
Engineering Excluding on-site inspection	$ 20,000
TOTAL ESTIMATED COST	$ 565,000

A comparison of the estimated costs for the two alternates indicates that the two span arrangement is about 3% lower than the three span arrangement.

The two span bridge with the exception of the steel girders can be constructed by a local contractor using local material for the deck and crib substructure. The fabrication and erection of the steel girders must be done by a structural steel sub-contractor utilizing skilled labour.

6.3 Estimated On-Site Labour

The construction of the two span bridge on the permanent roadway alignment is estimated to require a total labour force of about ten to twelve men. Six to eight men could be local unskilled labour and the remaining four men would direct operations and be capable of operating heavy equipment. It is estimated that the bridge would be constructed over a period ranging between 20 and 24 weeks.

7.0 CONSTRUCTION CONSTRAINTS AND BRIDGE PERFORMANCE

7.1 Environmental Impact

Environmental concerns for fish migration require that no work in the river channel be allowed between the end of April and the end of September which allows no time for construction of the river piers during the summer months. Excavation for the pier foundation in the river channel is required and can be completed in the late fall or winter months. The excavation can be expected to produce considerable siltation of the river water since the excavated area will not be protected by sheet piling. Therefore, it is desirable that as few piers be constructed in the river channel as possible and is another reason why the two span structure rather than three span structure should be constructed at the Netla site.

7.2 Bridge Performance

The bridges proposed for the temporary crossing in our opinion should be virtually maintenance free for a period ranging between 5 and 10 years except for damage to the deck surface or bridge railing caused by traffic. Beyond the 5 to 10 year period annual inspections will be necessary to determine the condition of the timber and the serviceability of the structure.

8.0 SUMMARY

1. Timber for construction of the bridge is available locally but is too small in cross section and too short to be used for the main bridge beams. The timber, however, is more suitable for timber cribs and decking.

2. All the timber should be sawn and treated by dipping in pentachlorophenol. The timber determines the temporary bridge service life which is estimated to range between 8 and 15 years.

8.0 SUMMARY, contd.

3. A two span single lane bridge 55 m long having a timber deck supported on twin steel I-girders is the most economic bridge arrangement for the off-set alignment and is estimated to cost $300,000 including a contingency allowance and design engineering. It is estimated that ten to twelve men are required for a 16 to 20 week period to construct the bridge. Six to eight men could be local unskilled labourers.

4. A two span two lane bridge having a timber deck supported on steel girders which rest on rock filled timber cribs is the most economic structure type for the temporary structure having an alignment identical to the proposed Permanent Bridge. The estimated cost of the structure including a contingency allowance and engineering amounts to $550,000. It is estimated that ten to twelve men are required for a 20 to 24 week period to construct the bridge. Six to eight men could be local unskilled labourers.

9.0 RECOMMENDATIONS

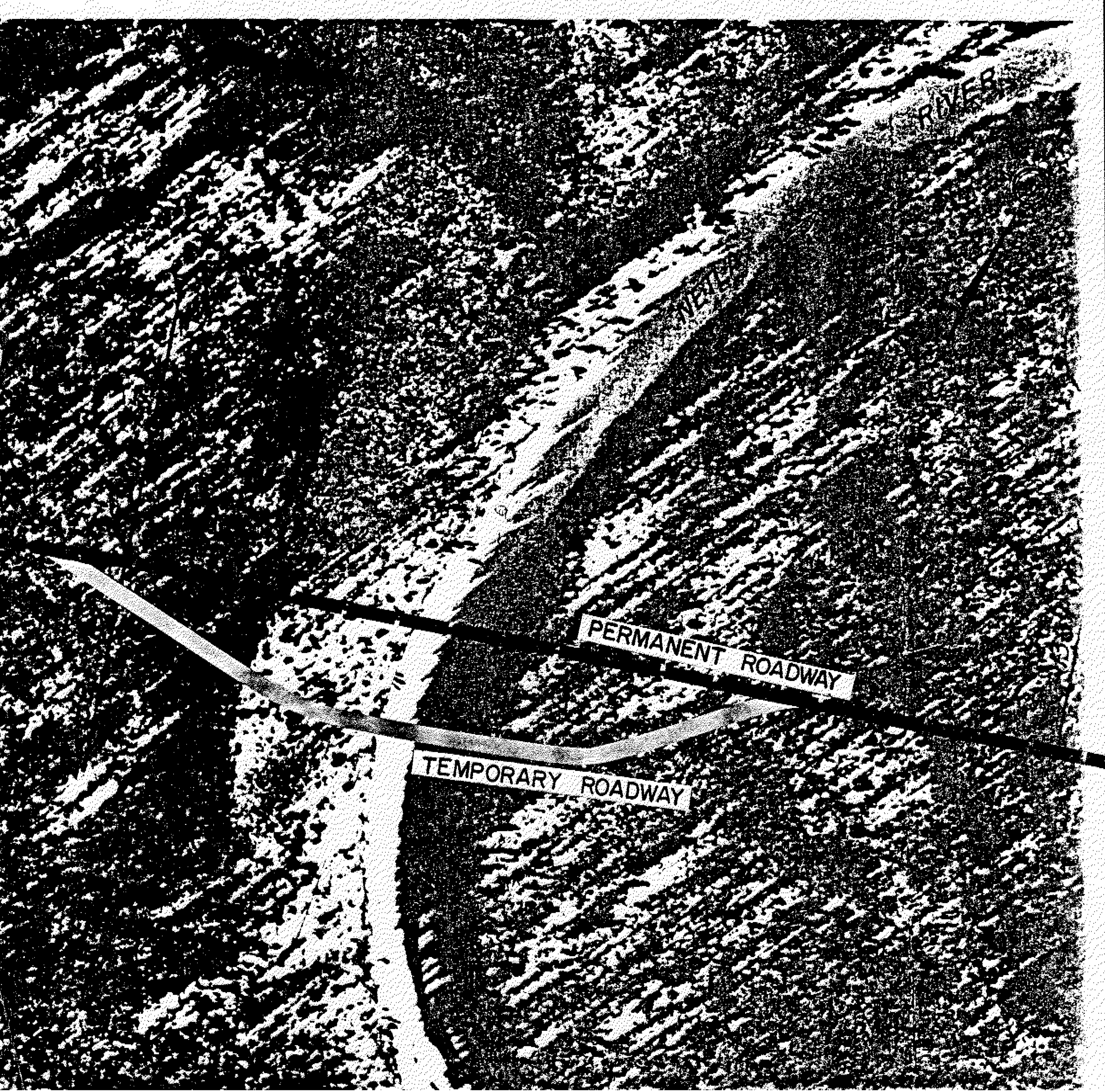
1. In the event that a single lane bridge on an offset alignment is acceptable to Public Works Canada, a two span structure as shown on Fig. 2 having a deck elevation identical to the proposed permanent structure is recommended for the temporary bridge over the Netla River.

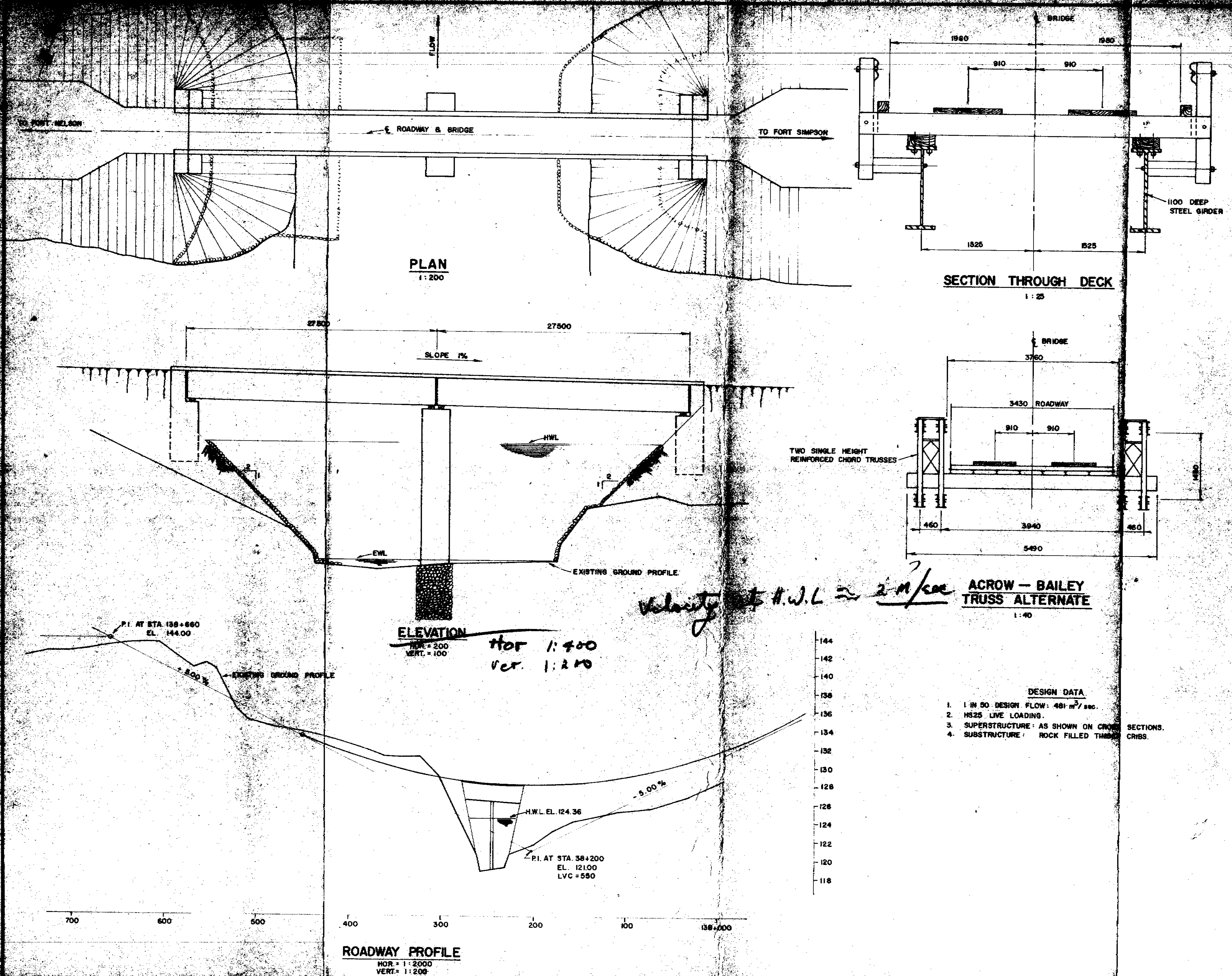
Respectfully Submitted,

L. F. Yasinko

L.F. Yasinko, P.Eng.

FIG. I.





REFERENCE DRAWINGS

DRAWING NO	TITLE

NO	DATE	BY	CHK'D	MECH	INSTR	ELECT	CIVIL	PROC	PROJ ENG

REVISIONS

NO	DESCRIPTION

SCALE	AS SHOWN	DESIGNED	L.F.Y.	DRAWN	L.C.S.

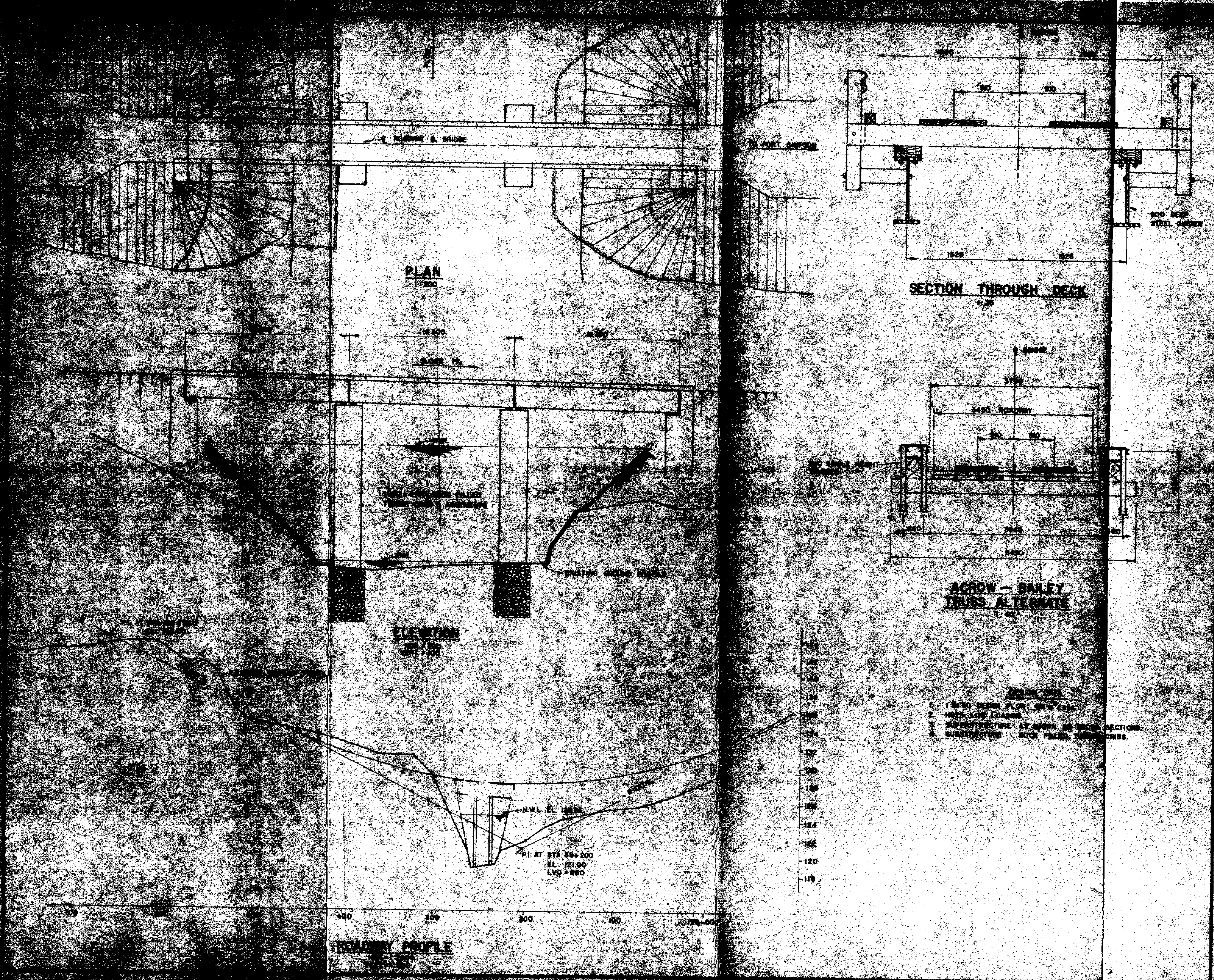
ASSOCIATED ENGINEERING SERVICES LTD.

D.P.W. FED. GOV.

ALTERNATE I. TWO SPAN
PROPOSED TEMPORARY NETLA RIVER BRIDGE

GENERAL LAYOUT

JOB NO	DRAWING NUMBER	REV
E58E	FIG.2	



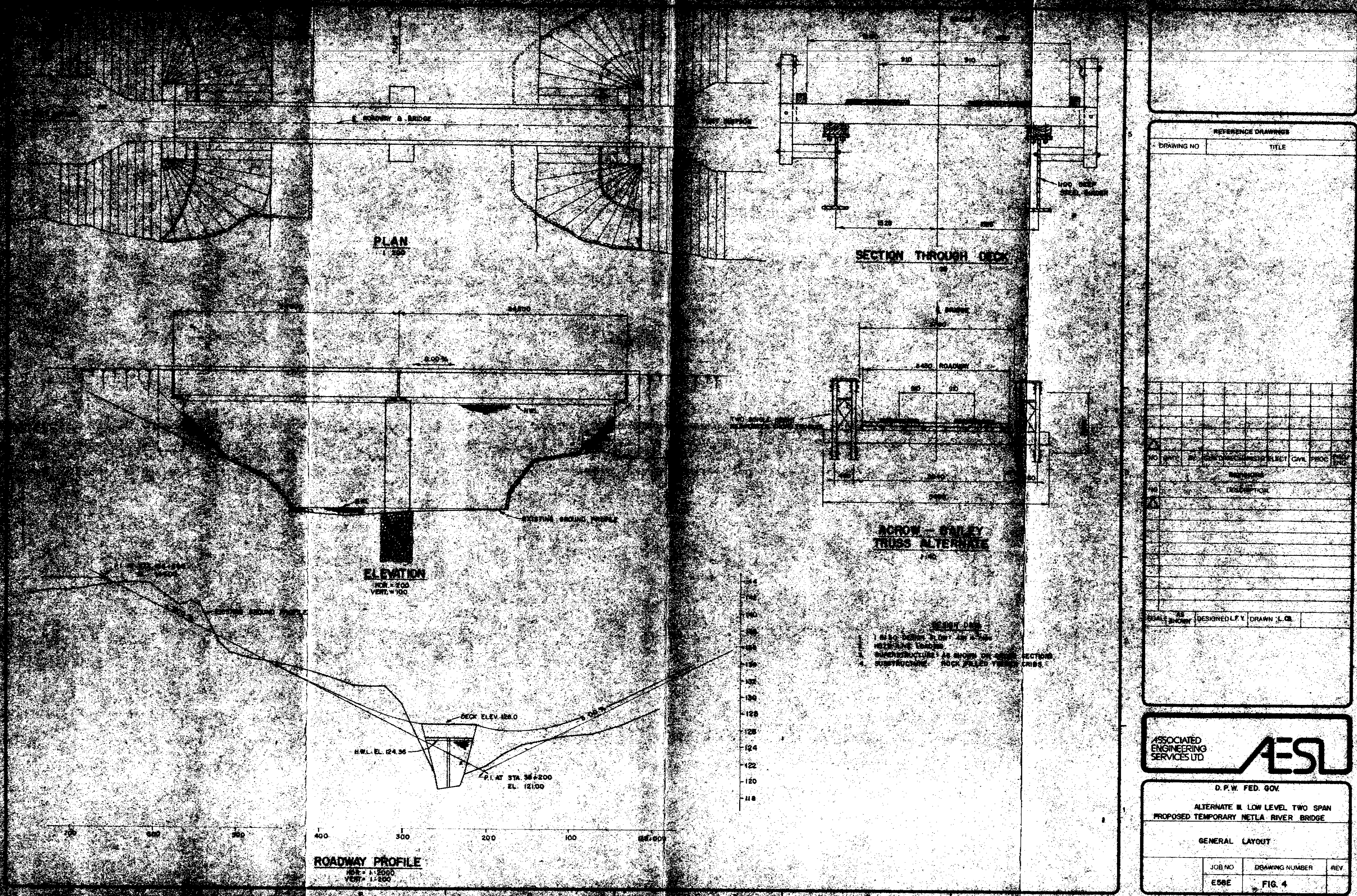
ASSOCIATED ENGINEERING SERVICES LTD

D.P.W. FED. GOV.

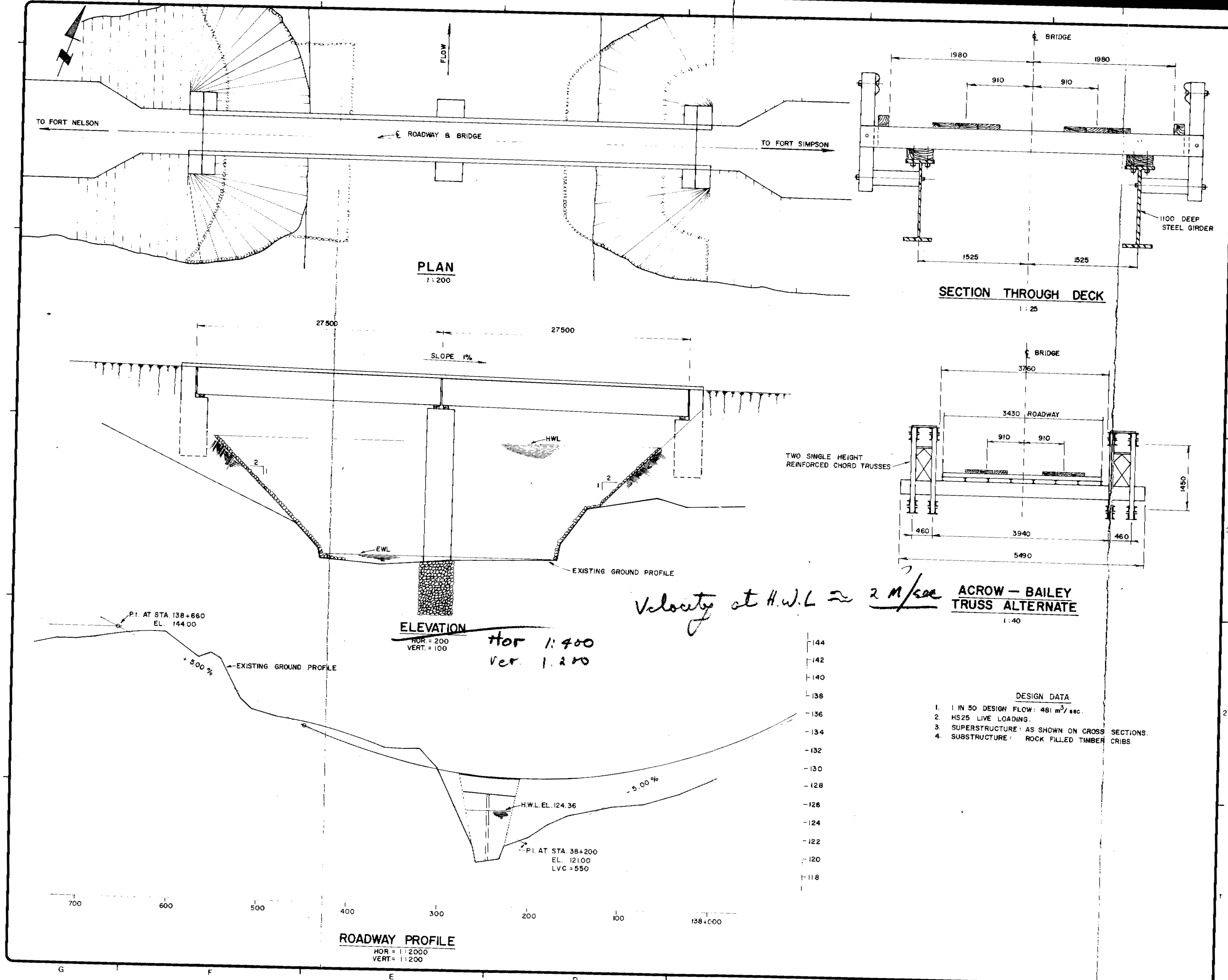
ALTERNATE II. THREE SPAN
PROPOSED TEMPORARY NETLA RIVER BRIDGE

GENERAL LAYOUT

JOB NO	DRAWING NUMBER	REV.
E.982	FIG. 3	



PLAN
1:200
SECTION THROUGH DECK
ELEVATION
HOR. = 200
VERT. = 100
EXISTING GROUND PROFILE
ACROW — BAILEY
TRUSS ALTERNATE
DECK ELEV. 128.0
H.W.L. EL. 124.36
P.I. AT STA. 36+200
EL. 121.00
ROADWAY PROFILE
HOR. = 1:2000
VERT. = 1:200
REFERENCE DRAWINGS
DRAWING NO
TITLE
DESCRIPTION
SCALE AS SHOWN
DESIGNED L.F.Y.
DRAWN L.C.
ASSOCIATED ENGINEERING SERVICES LTD.
AESL
D.P.W. FED. GOV.
ALTERNATE III. LOW LEVEL TWO SPAN
PROPOSED TEMPORARY NETLA RIVER BRIDGE
GENERAL LAYOUT
JOB NO
E58E
DRAWING NUMBER
FIG. 4
REV.



REFERENCE DRAWINGS

DRAWING NO	TITLE

NO	DATE	BY	CHK'D	MECH	INSTR	ELECT	CIVIL	PROC	PROJ ENG

REVISIONS

NO	DESCRIPTION

SCALE AS SHOWN | DESIGNED L.F.Y. | DRAWN L. CS.

ASSOCIATED ENGINEERING SERVICES LTD

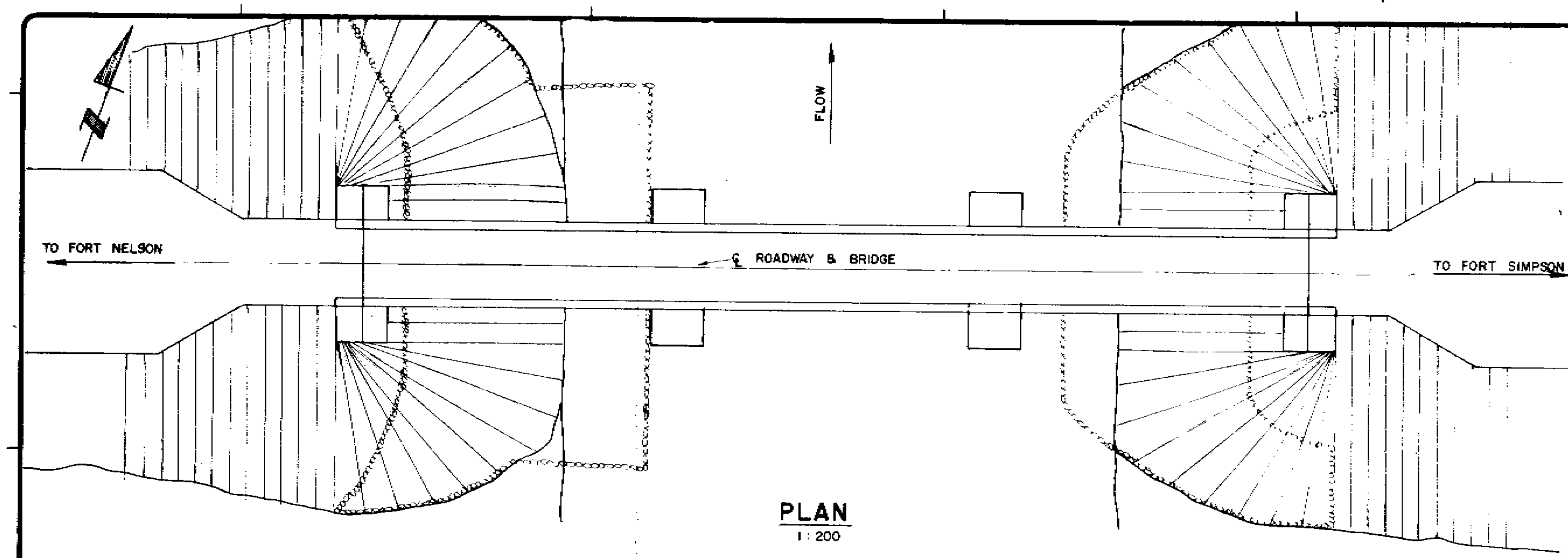
AESL

D.P.W. FED. GOV.

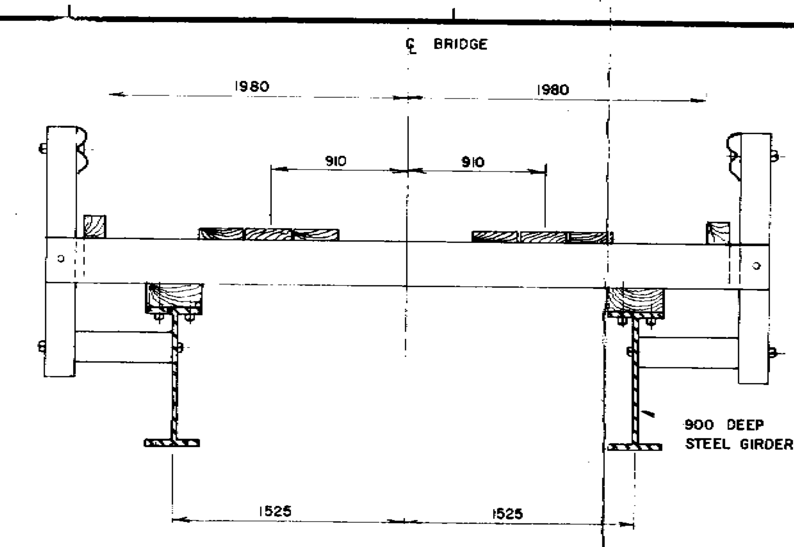
ALTERNATE 1. TWO SPAN
PROPOSED TEMPORARY NETLA RIVER BRIDGE

GENERAL LAYOUT

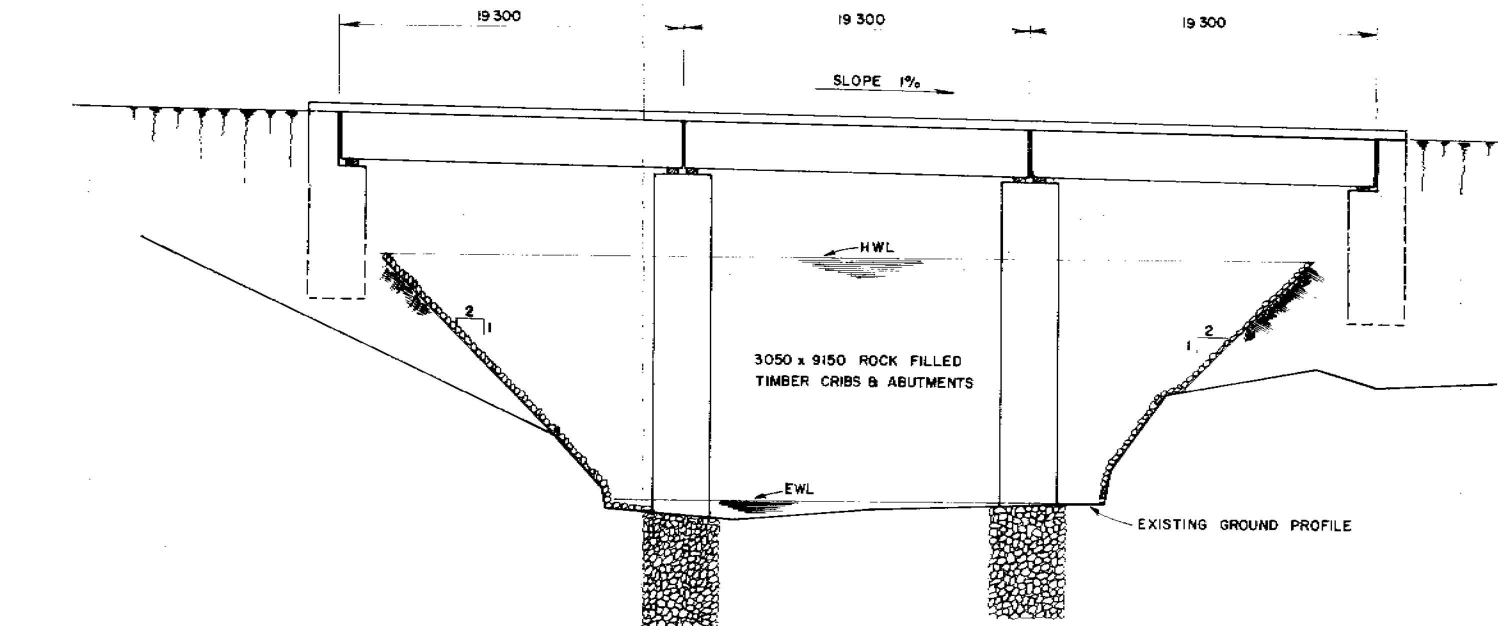
JOB NO	DRAWING NUMBER	REV
E58E	FIG. 2	



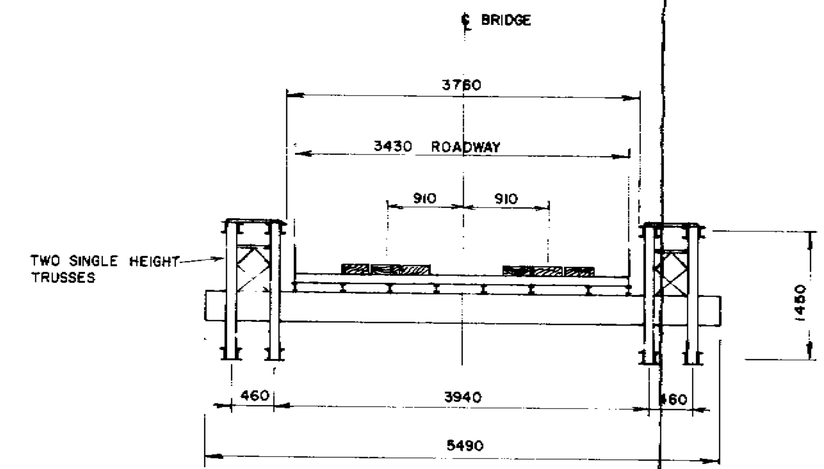
PLAN
1 : 200



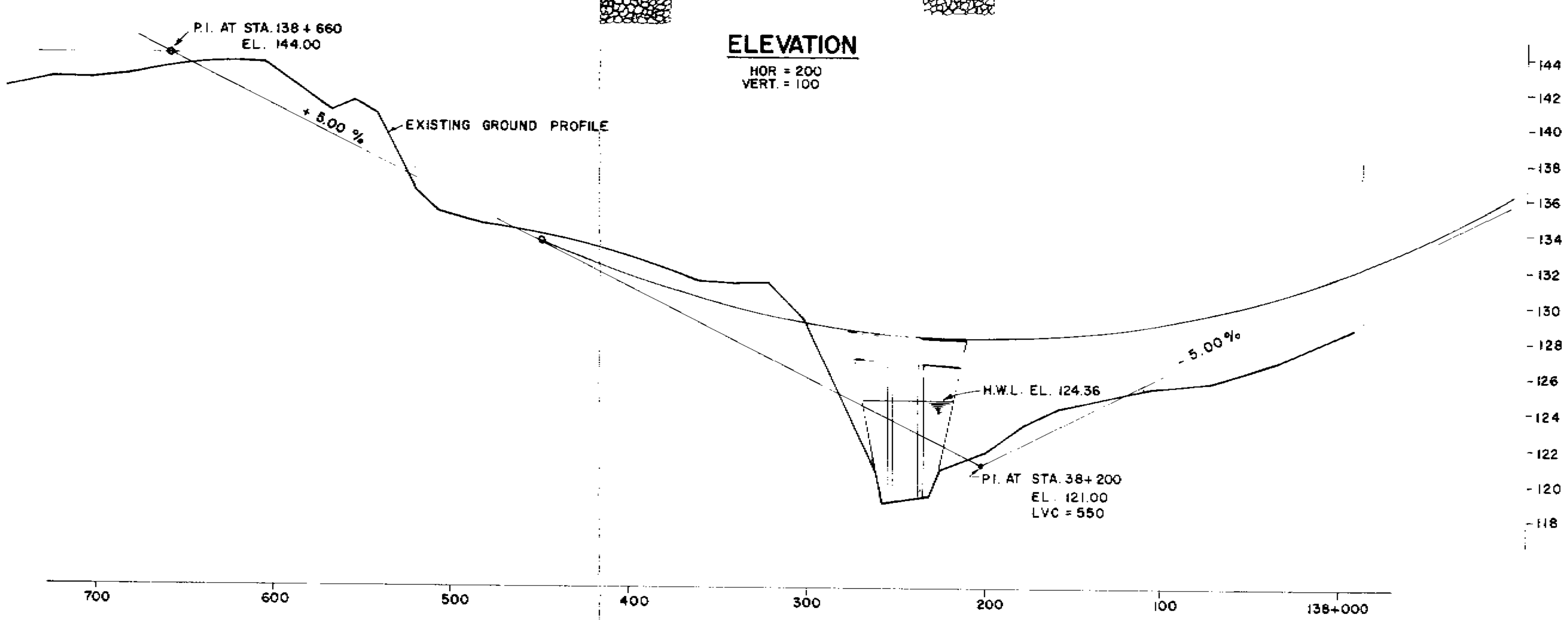
SECTION THROUGH DECK
1 : 25



ELEVATION
HOR = 200
VERT. = 100



ACROW — BAILEY TRUSS ALTERNATE
1 : 40



ROADWAY PROFILE
HOR. = 1 : 2000
VERT. = 1 : 200

DESIGN DATA

1. 1 IN 50 DESIGN FLOW: 481 m^3/sec.
2. HS25 LIVE LOADING.
3. SUPERSTRUCTURE: AS SHOWN ON CROSS SECTIONS.
4. SUBSTRUCTURE: ROCK FILLED TIMBER CRIBS.

REFERENCE DRAWINGS

DRAWING NO	TITLE

NO	DATE	BY	CHK'D	MECH	INSTR	ELECT	CIVIL	PROC	PROJ ENG

REVISIONS

NO	DESCRIPTION

SCALE AS SHOWN | DESIGNED L.F.Y. | DRAWN L.C.S.

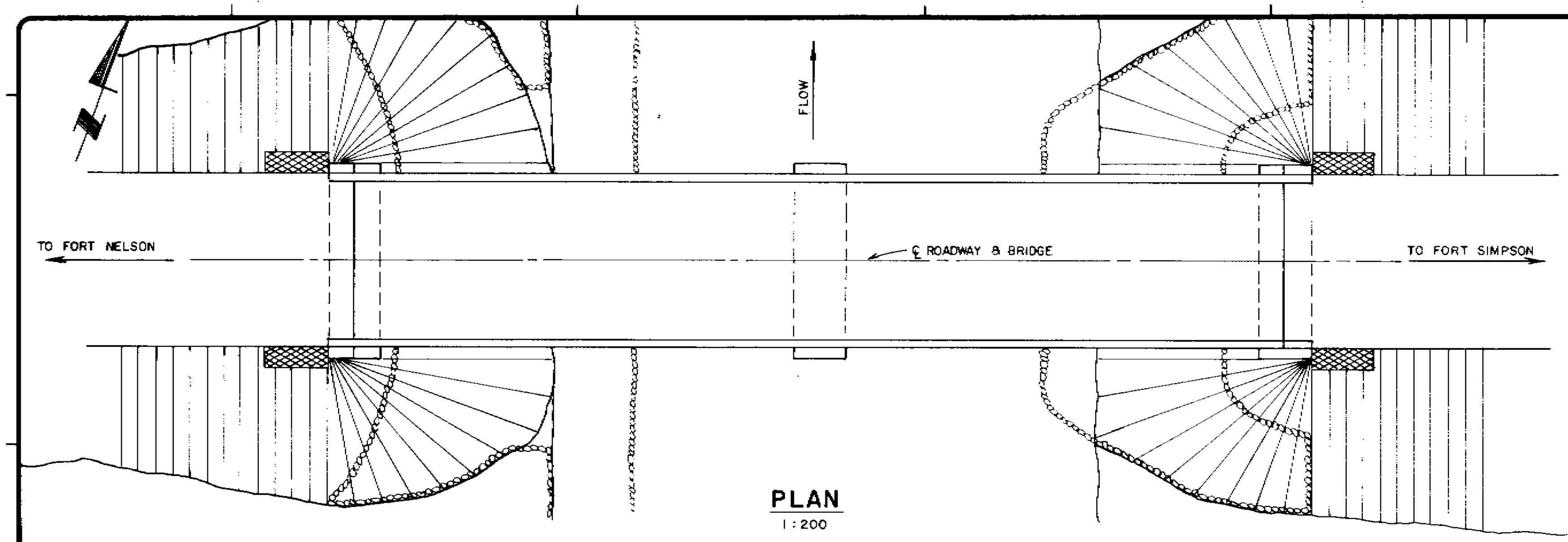
ASSOCIATED ENGINEERING SERVICES LTD. AESL

D.P.W. FED. GOV.

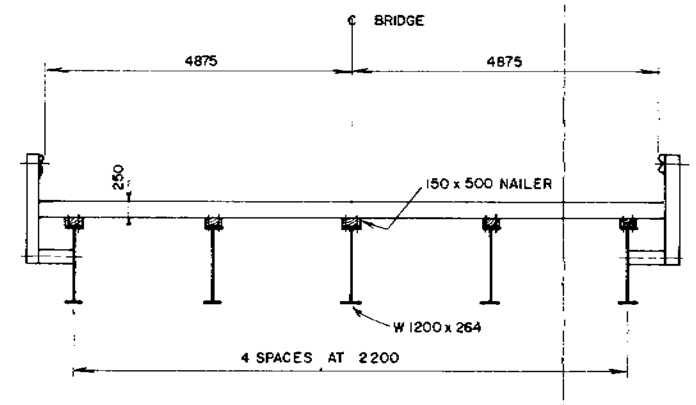
ALTERNATE II. THREE SPAN
PROPOSED TEMPORARY NETLA RIVER BRIDGE

GENERAL LAYOUT

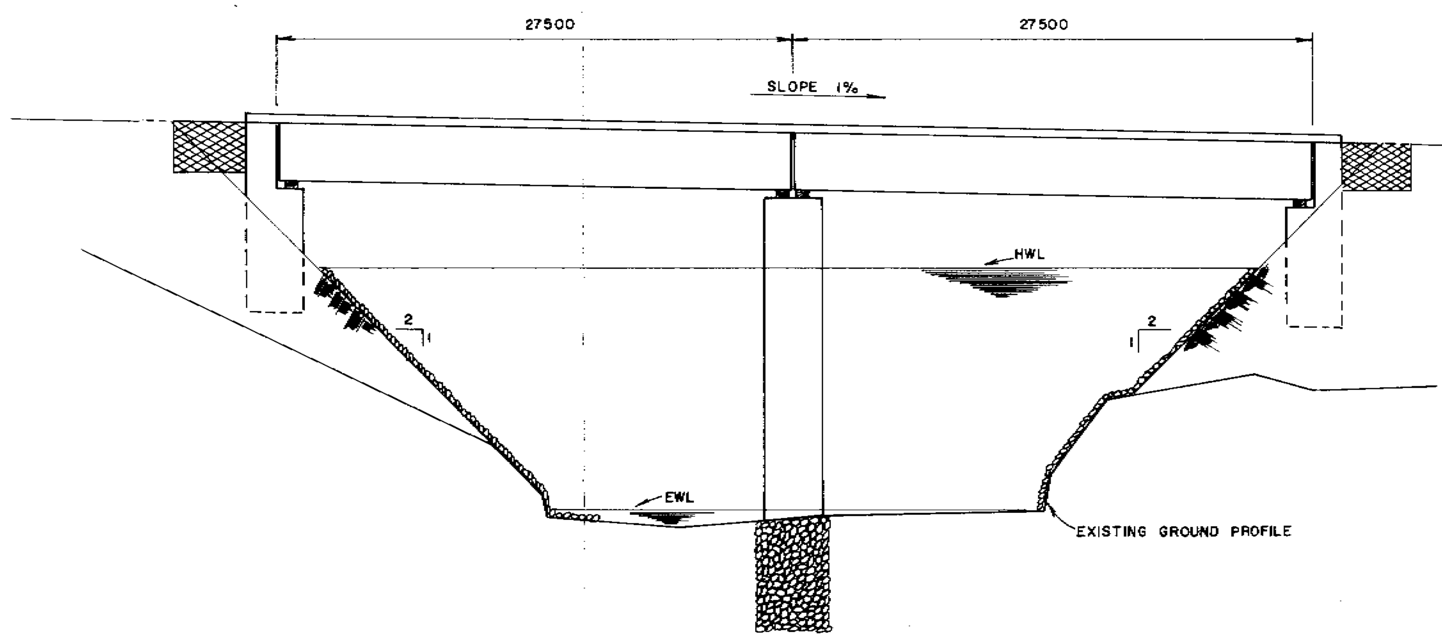
JOB NO	DRAWING NUMBER	REV.
E 58E	FIG. 3	



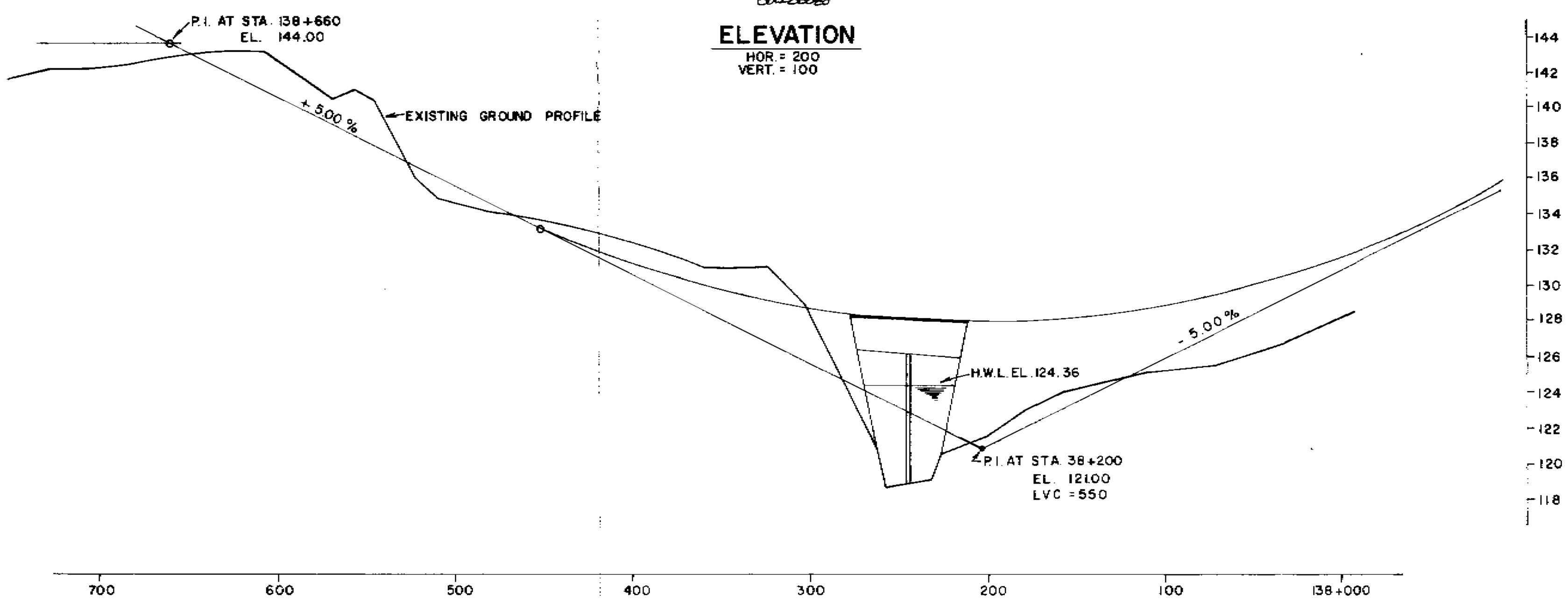
PLAN
1:200



SECTION THROUGH DECK
1 = 60



ELEVATION
HOR. = 200
VERT. = 100



ROADWAY PROFILE
HOR. = 1:2000
VERT. = 1:200

DESIGN DATA

1. 1 IN 50 DESIGN FLOW: 481 m^3/sec
2. HS25 LIVE LOADING.
3. SUPERSTRUCTURE: AS SHOWN ON CROSS SECTIONS.
4. SUBSTRUCTURE: ROCK FILLED TIMBER CRIBS.

REFERENCE DRAWINGS

DRAWING NO	TITLE

NO	DATE	BY	CHK'D	MECH	INSTR	ELECT	CIVIL	PROC	PROJ ENG

REVISIONS

NO	DESCRIPTION

SCALE AS SHOWN | DESIGNED L.F.Y. | DRAWN L.C.S.

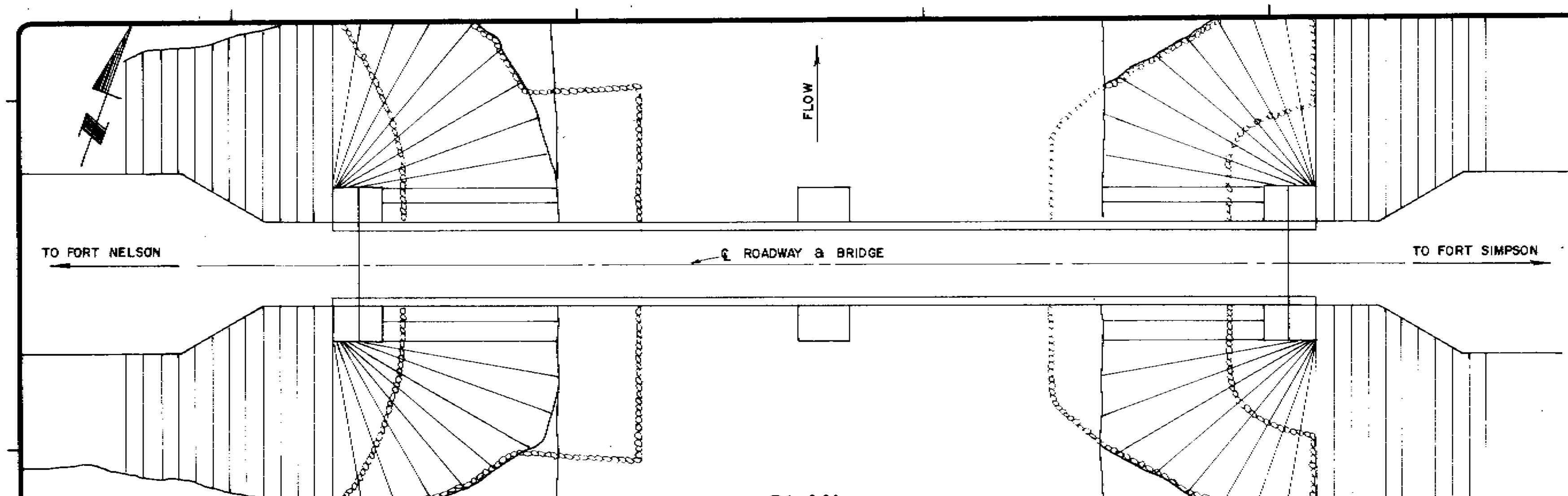
ASSOCIATED ENGINEERING SERVICES LTD
AESL

D.P.W. FED. GOV.

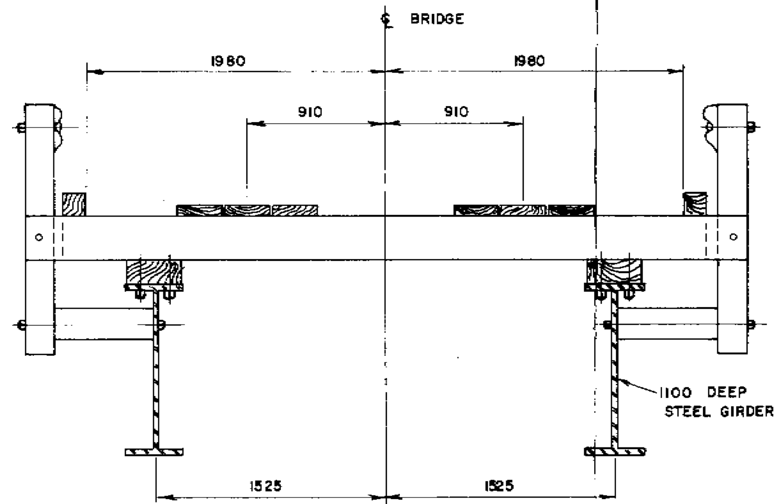
ALTERNATE IV. TWO SPAN
PROPOSED TEMPORARY NETLA RIVER BRIDGE

GENERAL LAYOUT

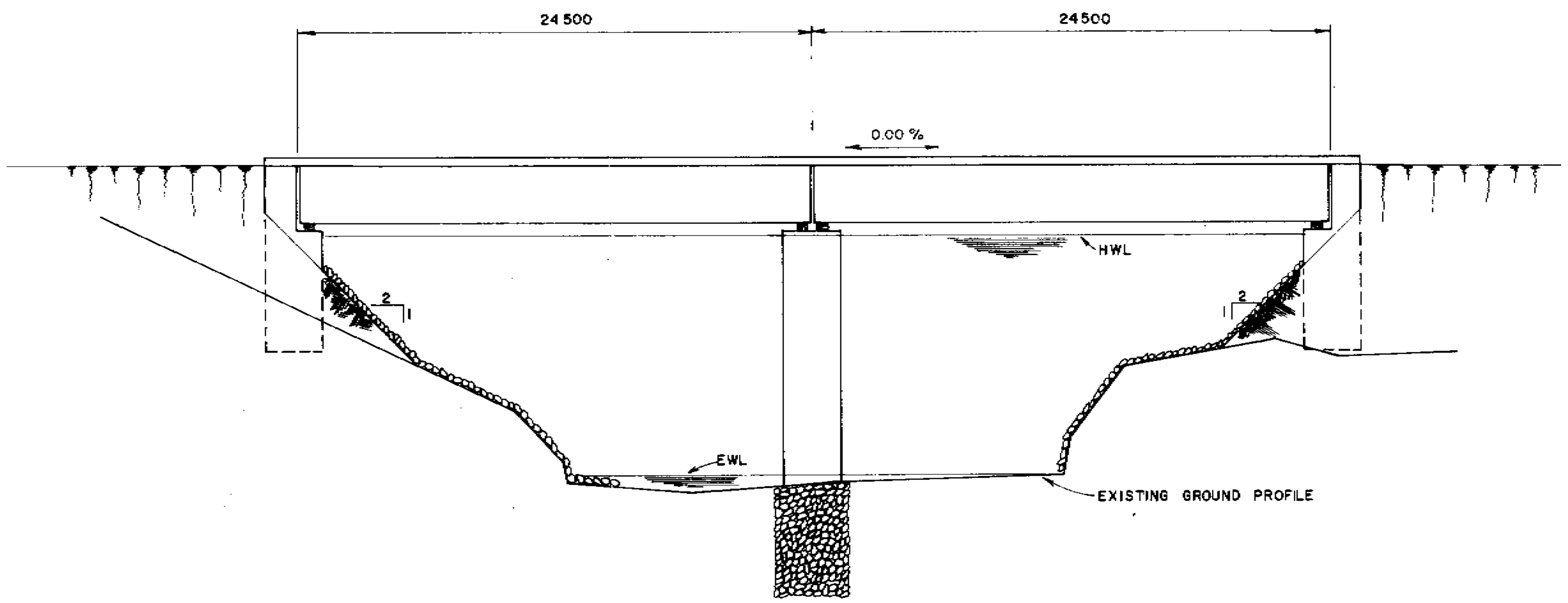
JOB NO	DRAWING NUMBER	REV
E58E	FIG. 5	



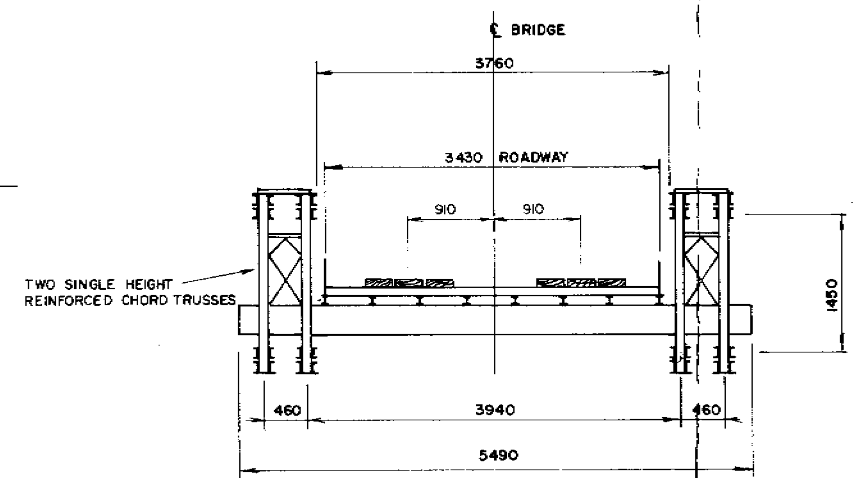
PLAN
1 : 200



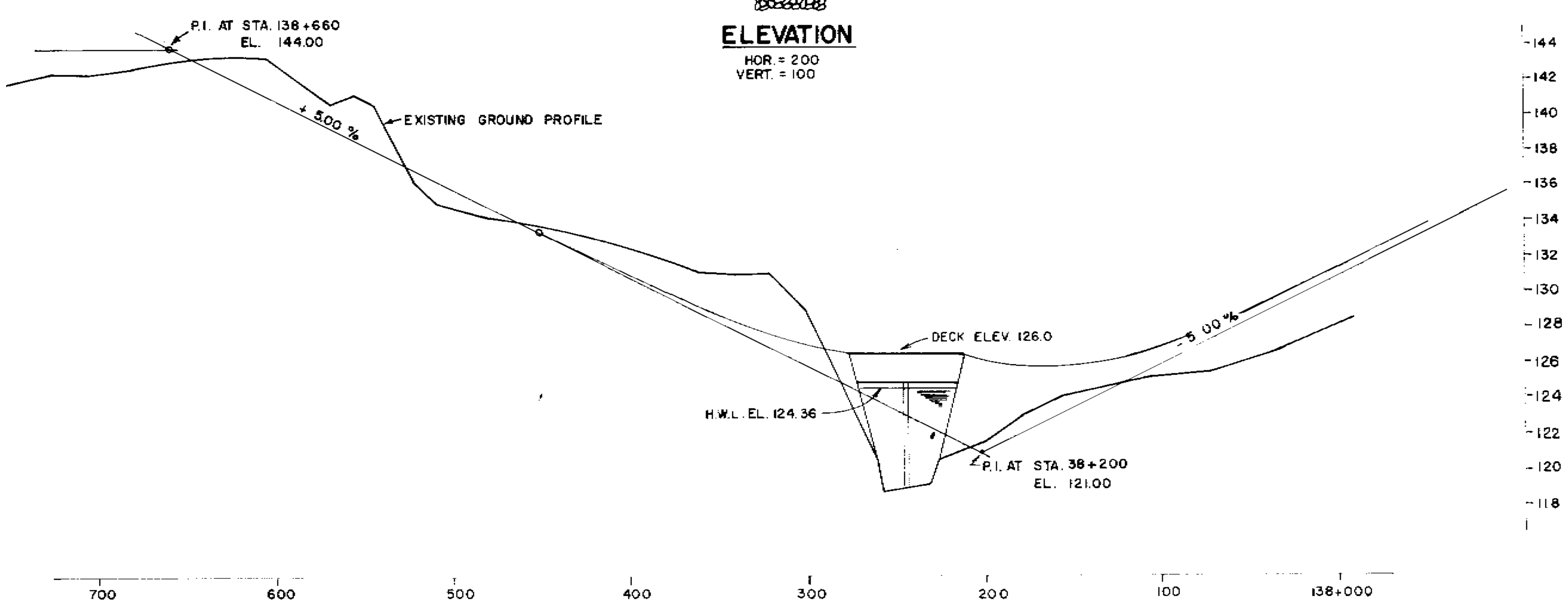
SECTION THROUGH DECK
1 : 25



ELEVATION
HOR. = 200
VERT. = 100



ACROW — BAILEY TRUSS ALTERNATE
1 : 40



ROADWAY PROFILE
HOR. = 1 : 2000
VERT. = 1 : 200

DESIGN DATA

1. 1 IN 50 DESIGN FLOW : 481 m^3/sec
2. HS25 LIVE LOADING.
3. SUPERSTRUCTURE : AS SHOWN ON CROSS SECTIONS.
4. SUBSTRUCTURE: ROCK FILLED TIMBER CRIBS.

REFERENCE DRAWINGS

DRAWING NO	TITLE

NO	DATE	BY	CHK'D	MECH	INSTR	ELECT	CIVIL	PROC	PROJ ENG

REVISIONS

NO	DESCRIPTION

SCALE AS SHOWN | DESIGNED L.F.Y. | DRAWN L.CS.

ASSOCIATED ENGINEERING SERVICES LTD — AESL

D.P.W. FED. GOV.

ALTERNATE III. LOW LEVEL TWO SPAN
PROPOSED TEMPORARY NETLA RIVER BRIDGE

GENERAL LAYOUT

JOB NO	DRAWING NUMBER	REV
E58E	FIG. 4	