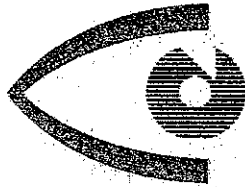


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O S I R I S

MARINE SERVICES

Ocean House

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T/F: +44 (0) 1282 601525

M: 0836-247421

"WHALLEY BRIDGE"

923

LANCASHIRE COUNTY COUNCIL

INITIAL UNDERWATER STRUCTURAL INSPECTION BY DIVERS

GROUP J

DISTRICT 3

SEPTEMBER 1998

REPORT

LANCASHIRE COUNTY COUNCIL - HIGHWAY CONSULTANCY

"WHALLEY BRIDGE"

923

LANCASHIRE COUNTY COUNCIL
INITIAL UNDERWATER STRUCTURAL INSPECTION BY DIVERS
GROUP J

SEPTEMBER 1998

INDEX

INTRODUCTION	1
PLAN OF ACCESS GRID LOCATION (ORDINANCE SURVEY 1:50,000)	2
PLAN OF ACCESS GRID LOCATION (CAD 1:2,500)	3
REPORT PHOTOGRAPHS - GENERAL ARRANGEMENT (UPSTREAM / DOWNSTREAM / APPROACHES)	4 - 5
REPORT PHOTOGRAPHS - DETAIL (CONDITION / ANOMALY / UNDERWATER / MACRO)	6 - 15
REPORT PHOTOGRAPHS - SUPPLEMENTARY	16
PLAN DRAWINGS AND DATUM LOCATION (1:300)	17
ELEVATION DRAWING AND DATUM LOCATION - UPSTREAM (1:350)	18
HYDROGRAPHIC SOUNDING GRID	19 - 21
HYDROGRAPHIC COMPOSITION SAMPLING	19 - 21
DIVING STRUCTURAL EXAMINATION REPORT (DESCRIPTIVE)	22
DIVING STRUCTURAL EXAMINATION REPORT (ANOMALIES)	23
STRUCTURE CONDITION ASSESSMENT SUMMARY	24
INSPECTION ACCESS / QUALITY CHECK NOTES AND INSPECTION PERSONNEL	25
LANCASHIRE COUNTY COUNCIL CLIENT NOTES	26



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LOCATION PLAN (ORDINANCE SURVEY 1:50,000)

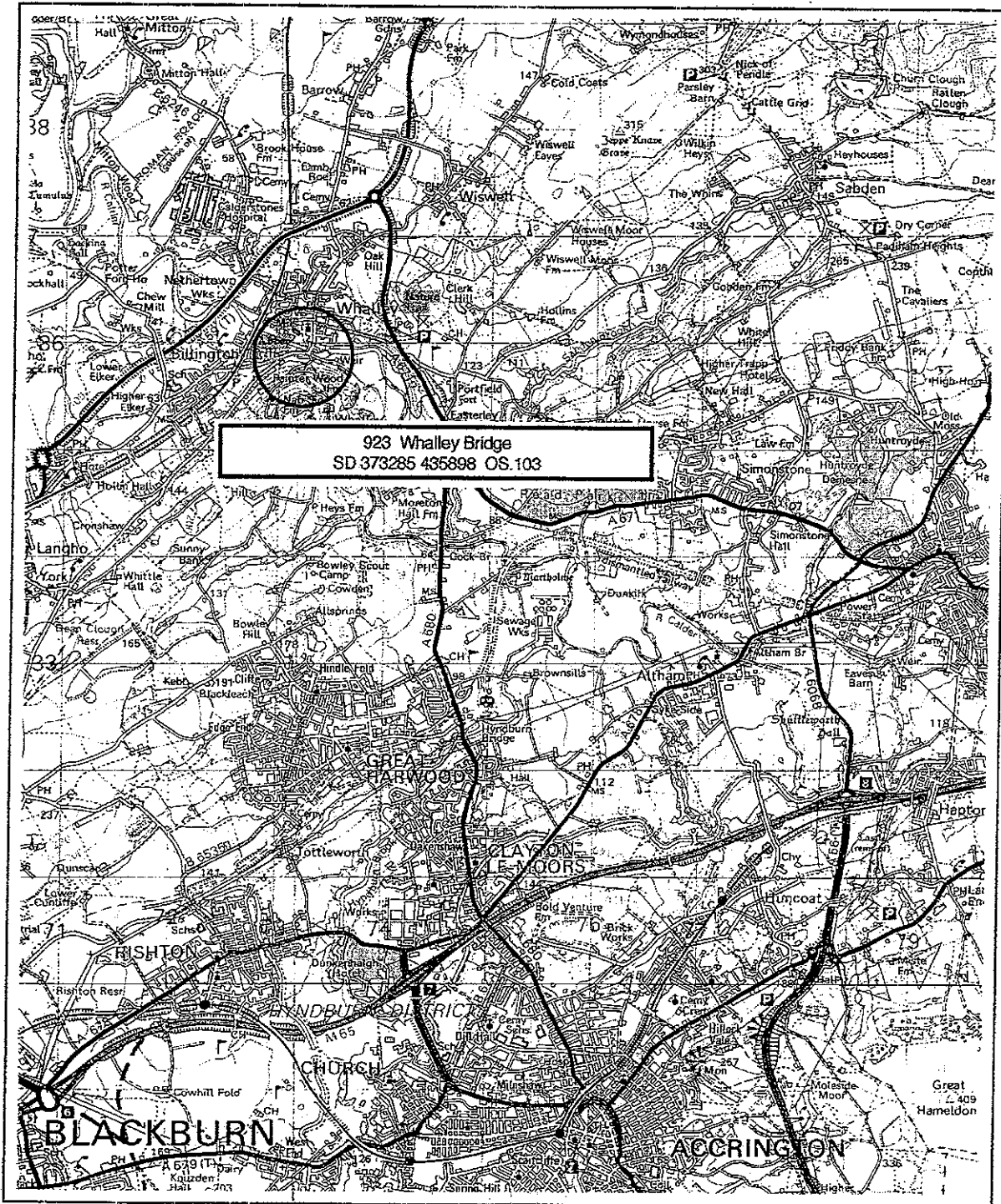
PRINCIPLE TOWN : Whalley
GRID REFERENCE : SD 373285 435898

NORTH (MAGNETIC)

WATER FLOW

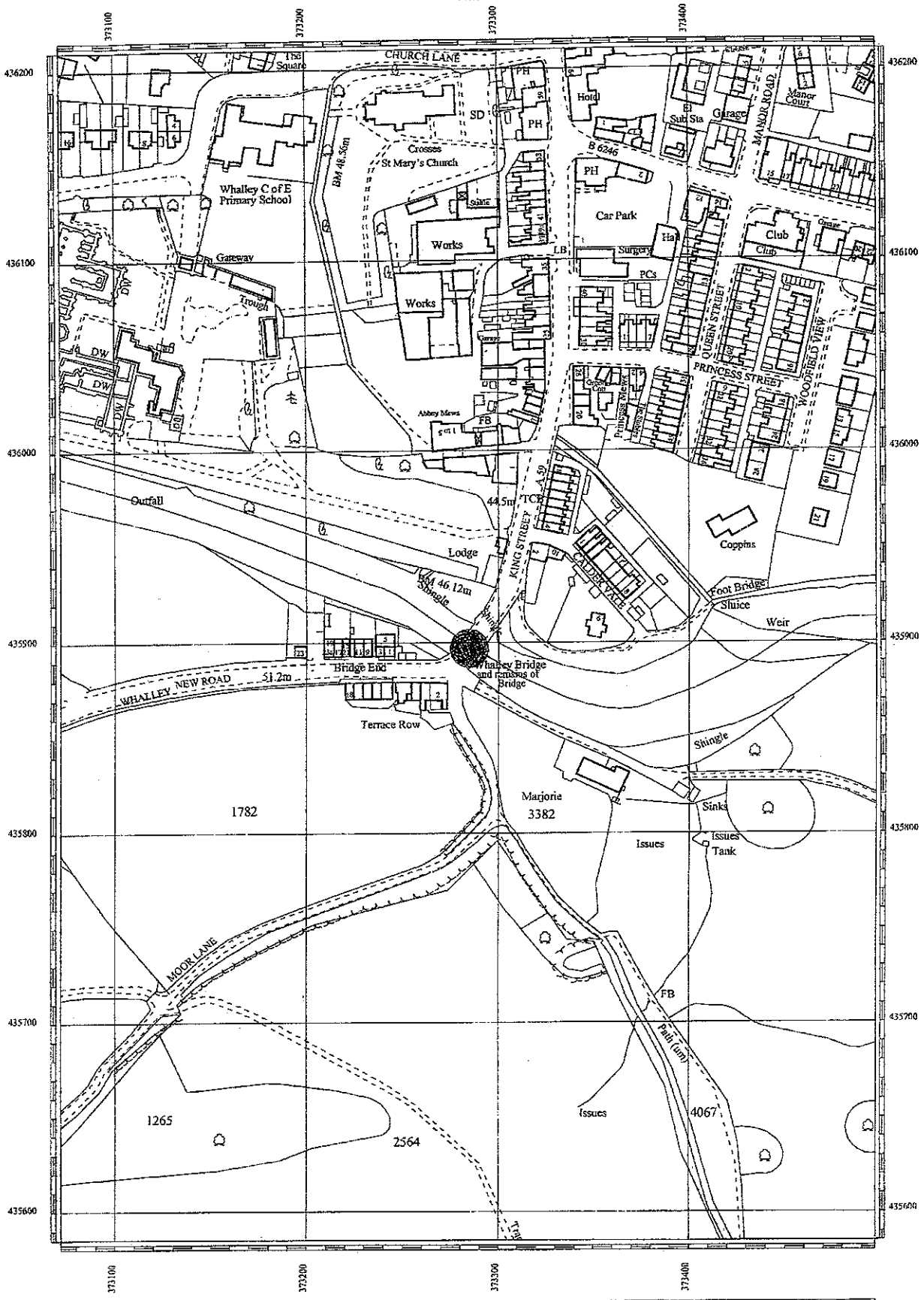


CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM



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4

PHOTOGRAPHS (GENERAL ARRANGEMENT)

FILM: 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

CONVENTION: LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.1 General view of upstream face looking downstream

WHALLEY



FLOW



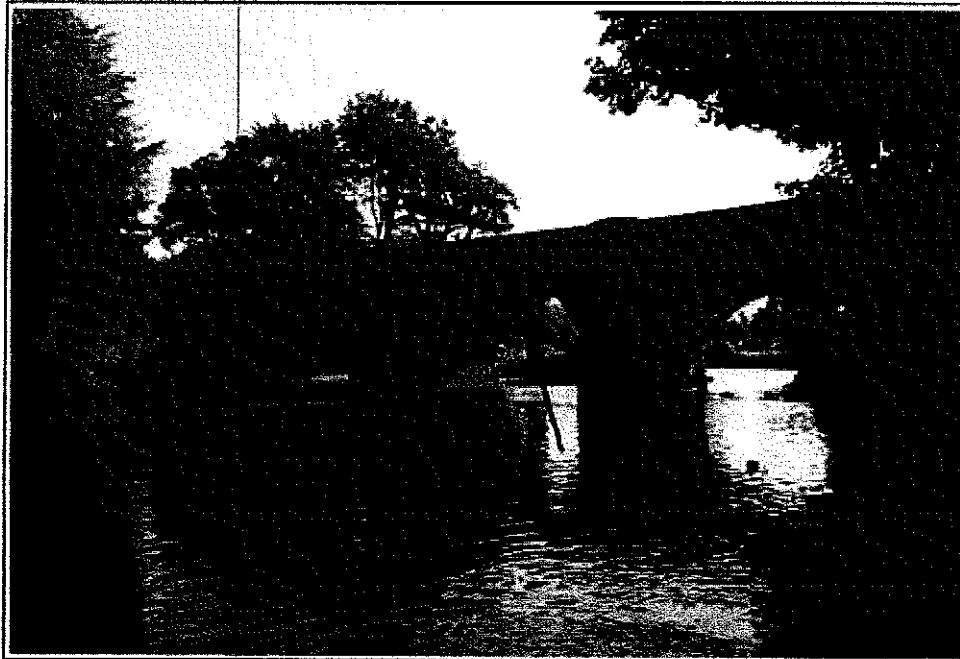
Multiple segmental arch with variable soffit profiles to upstream extension

No.2 General view of downstream face looking upstream

WHALLEY



FLOW



Multiple segmental arch with variable soffit construction throughout



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PHOTOGRAPHS (GENERAL ARRANGEMENT)

FILM : 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
 STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

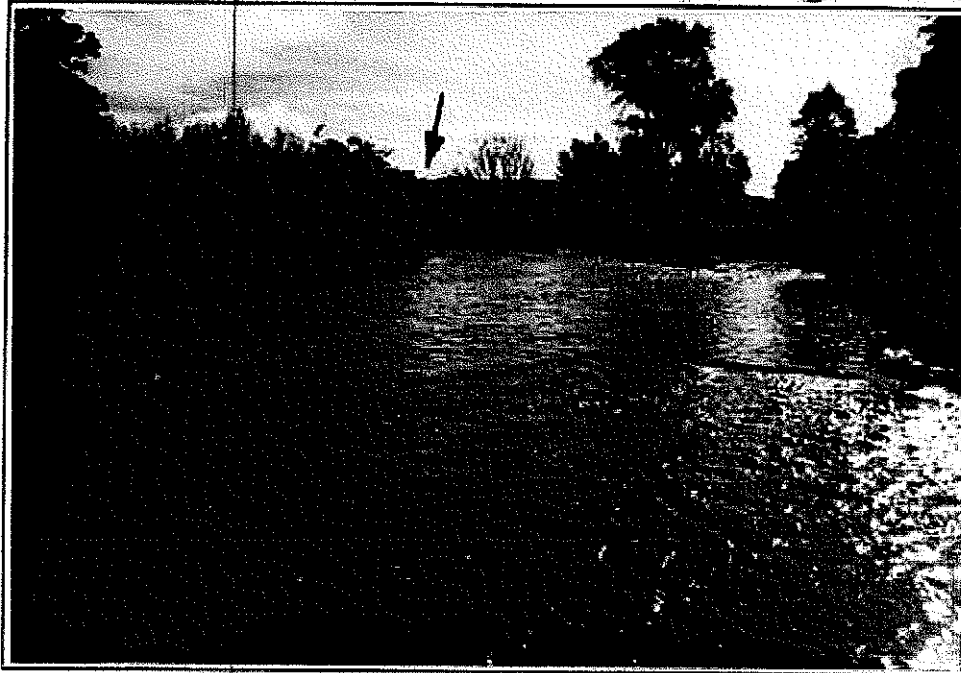
CONVENTION LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.3 General view from upstream face looking upstream

WHALLEY



FLOW



River Calder meandering watercourse with weir on upstream approach meander

No.4 General view from downstream face looking downstream

WHALLEY



FLOW



River Calder weir controlled channelled watercourse downstream



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PHOTOGRAPHS (DETAIL)

FILM : 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

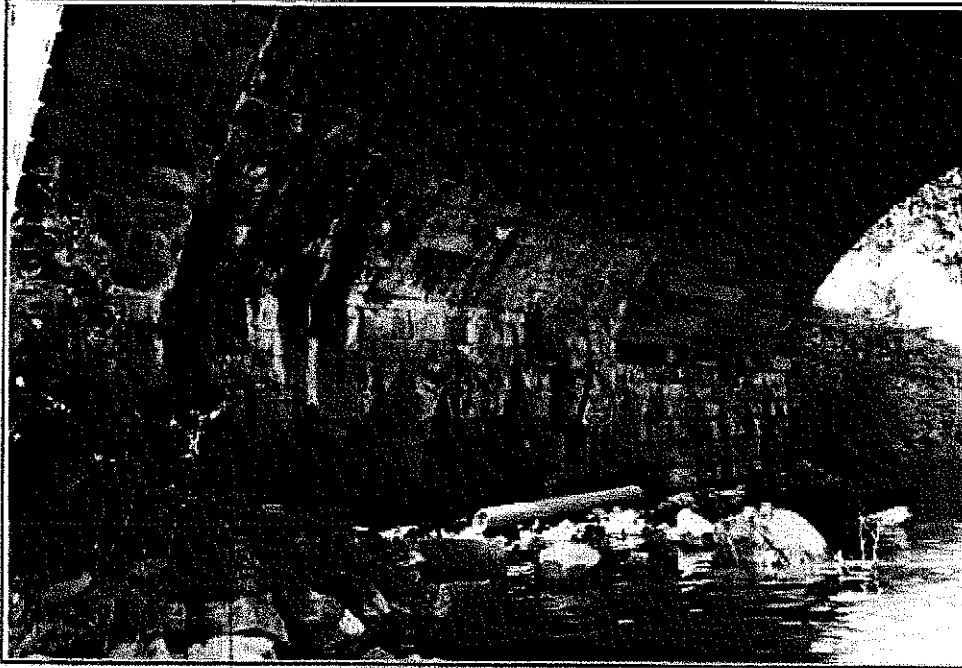
CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.5 Detail view of left abutment

WALLEY



FLOW



Upstream and downstream extensions with abutment masonry exposed under normal conditions

No.6 Detail view of right abutment

WALLEY



FLOW



Distinct and variable keyed extensions with bed deposit accumulations through span



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PHOTOGRAPHS (DETAIL)

FILM : 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
 STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

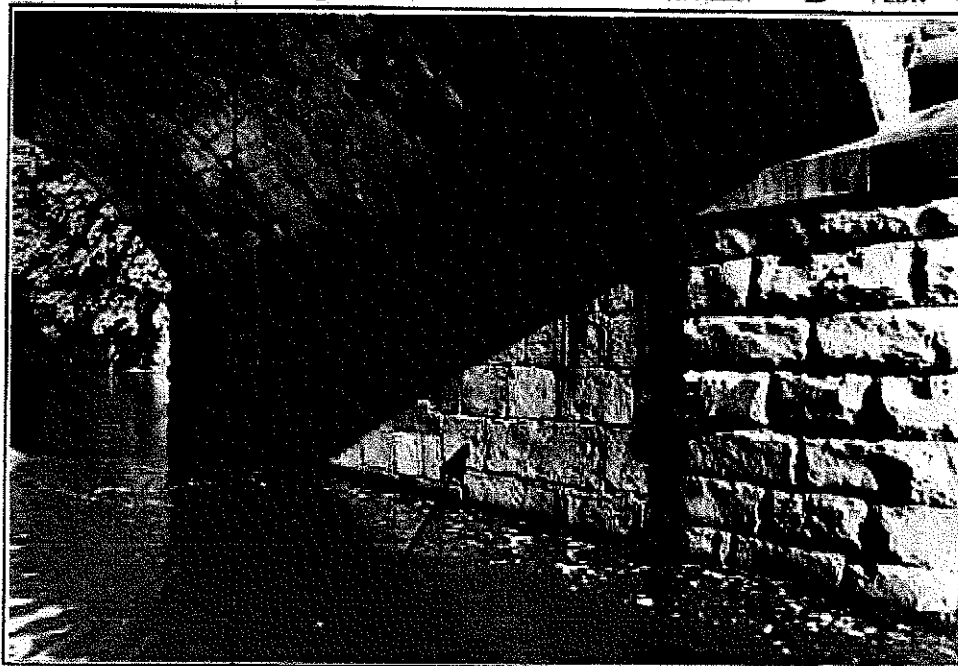
CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.7 Detail view of pier one left face looking downstream

WHALLEY



FLOW



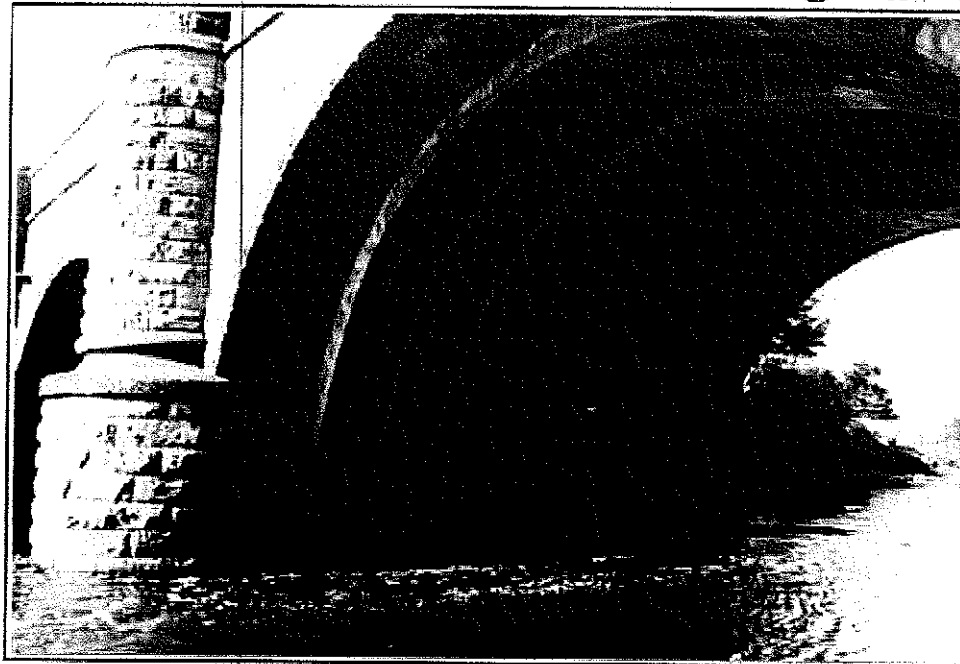
Typical pier and soffit masonry condition with surface mortar loss and isolated spalling throughout

No.8 Detail view of pier one right face

WHALLEY



FLOW



Typical pier and soffit masonry condition with variable extensions and isolated spall void at waterline



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PHOTOGRAPHS (DETAIL)

FILM : 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

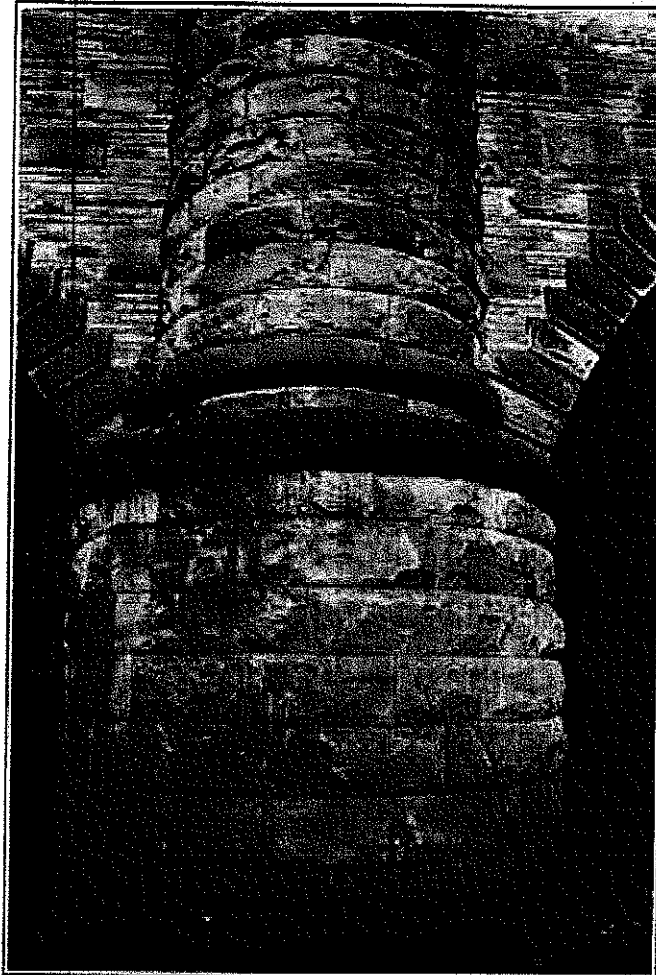
CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.9 Detail view of pier one upstream bullnose

WHALLEY



FLOW



Typical condition of bullnose and spandrel masonry with distinct vortex rotor formation



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PHOTOGRAPHS (DETAIL)

FILM : 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
 STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

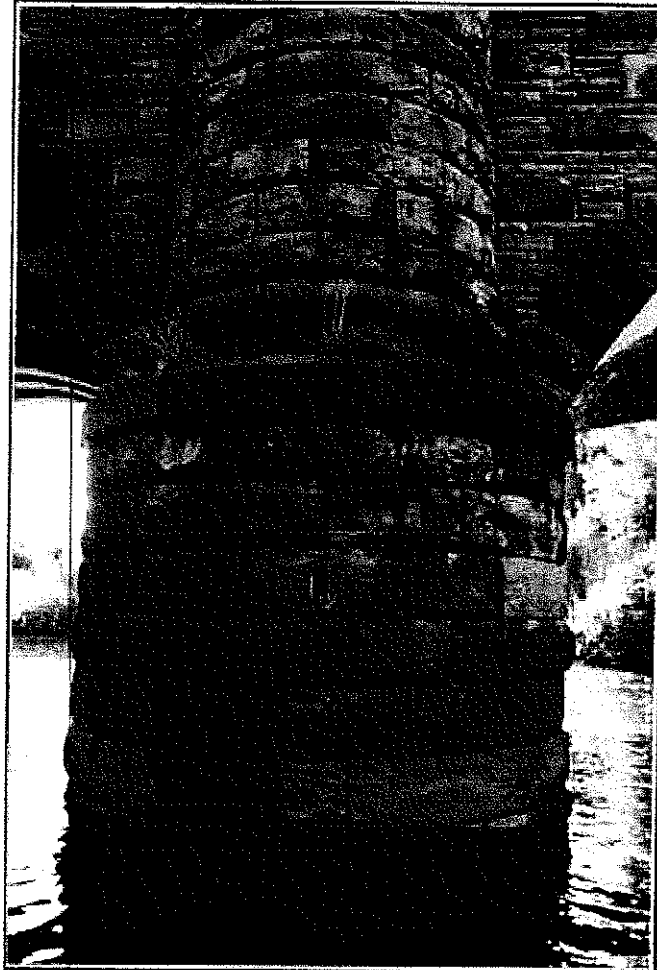
CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.10 Detail view of pier one downstream bulnose

WHALLEY



FLOW



Condition of bulnose masonry with localised seepage staining from coping



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PHOTOGRAPHS (DETAIL)

FILM : 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

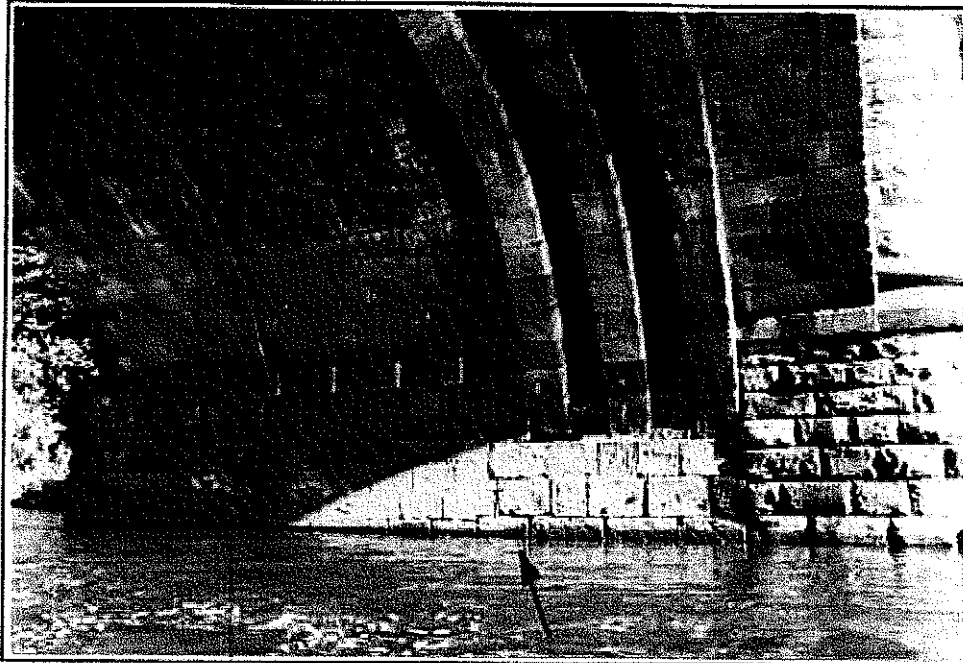
CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.11 Detail view of pier two left face

WHALLEY



FLOW



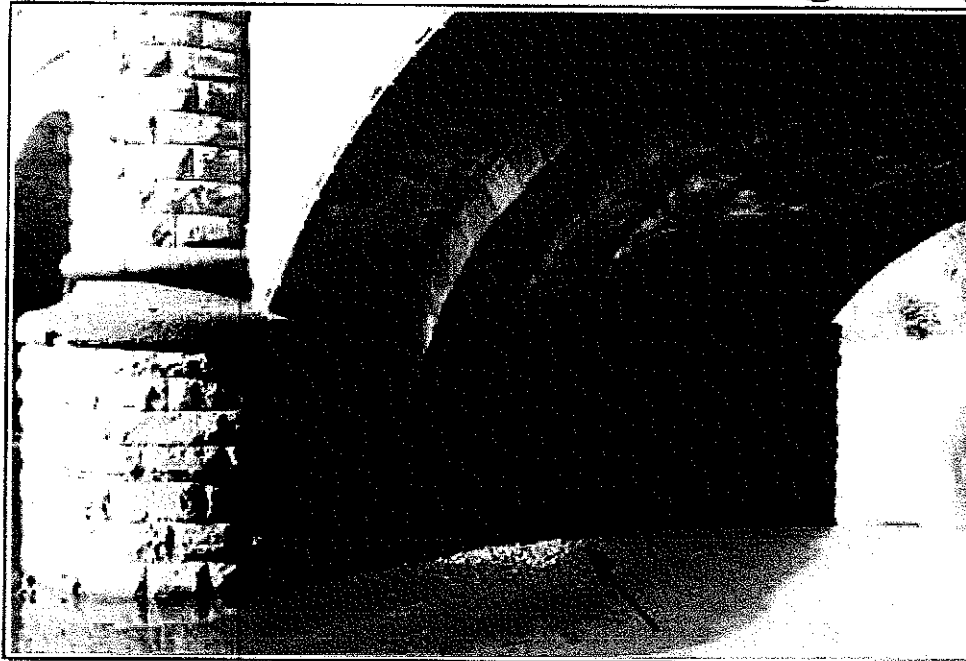
Typical pier and soffit masonry condition with isolated mortar washout to midsection waterline courses

No.12 Detail view of pier two right face

WHALLEY



FLOW



Bed deposit accumulations with isolated mortar washout to midsection base courses



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PHOTOGRAPHS (DETAIL)

FILM : 35mm KODAK EKTAR GSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

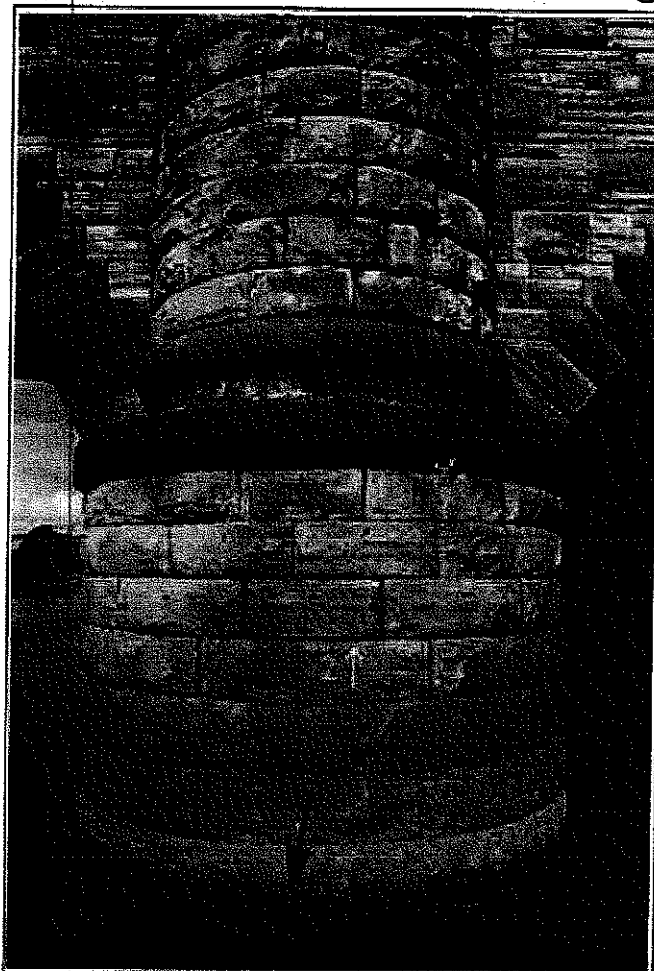
CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.13 Detail view of pier two upstream bulinose

WHALLEY



FLOW



Extension masonry in good condition with vortex rotor depressions to bed material



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12

PHOTOGRAPHS (DETAIL)

FILM : 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER. TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

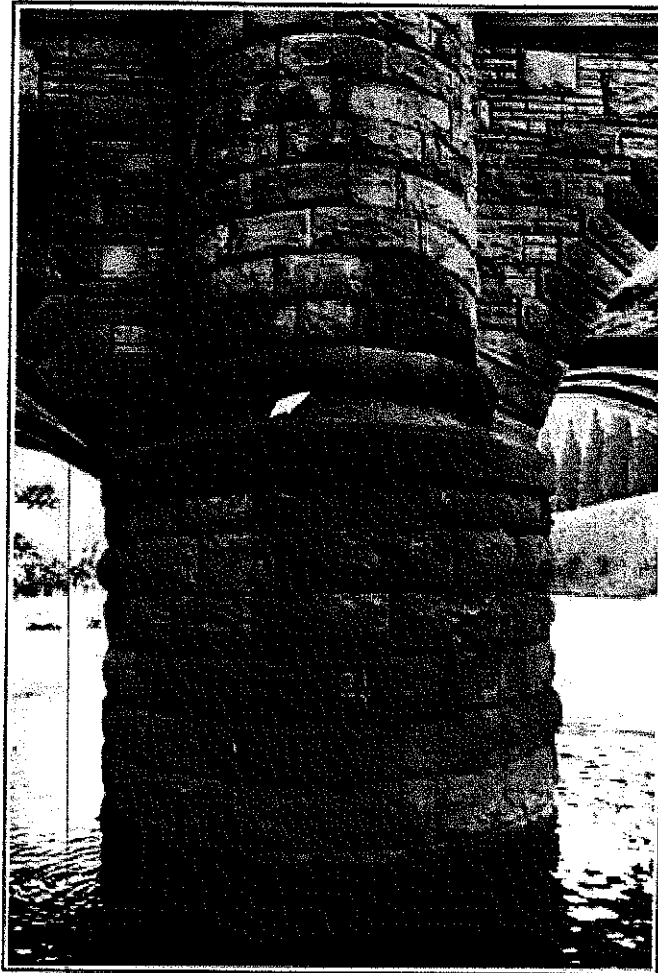
CONVENTION - LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.14 Detail view of pier two downstream bullnose

WHALLEY



FLOW



Bullnose and spandrel masonry in good condition



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PHOTOGRAPHS (DETAIL)

FILM : 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
 STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

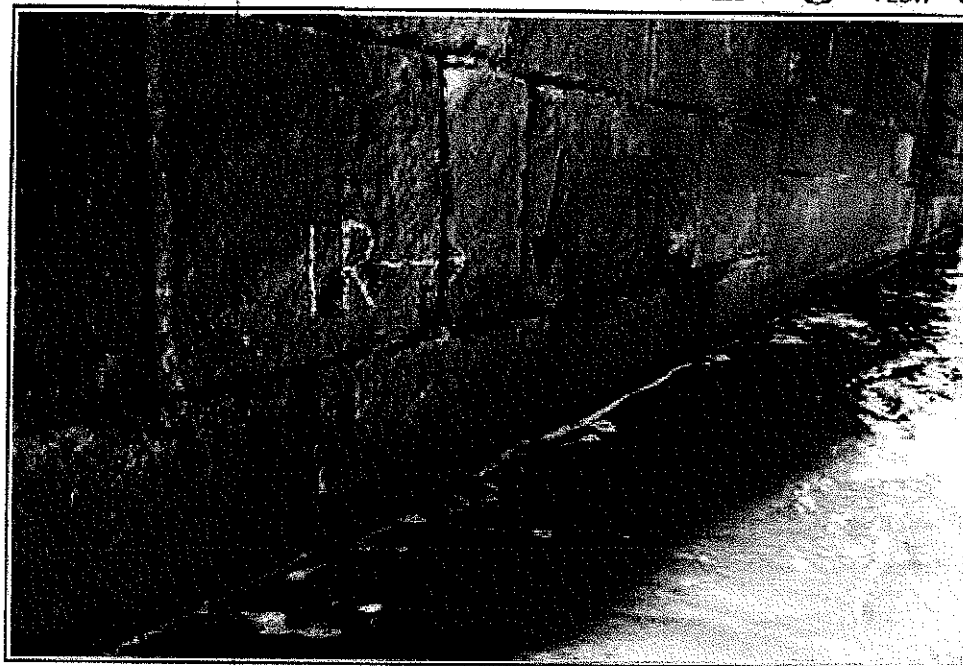
CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.15 Detail view of pier one upstream right waterline

WHALLEY



FLOW



Spall void with surrounding mortar loss on tight joints

No.16 Detail view of pier two upstream right waterline

WHALLEY



FLOW



Mortar loss and minor spalling to initial upstream extension with adjacent speedliner markings (purpose unknown)



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14

PHOTOGRAPHS (DETAIL)

FILM : 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

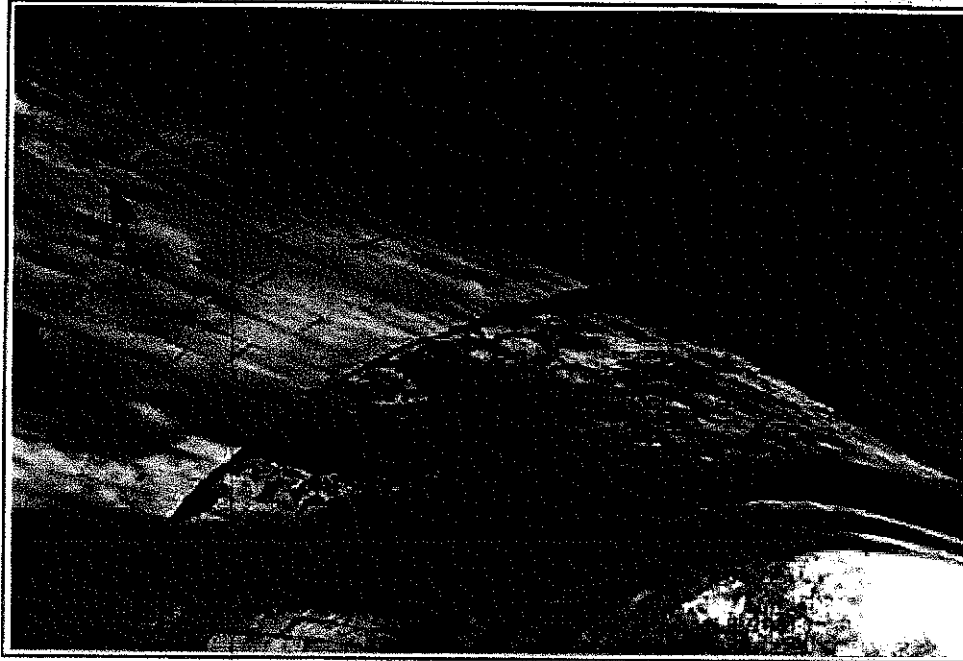
CONVENTION: LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.17 Detail view of span three soffit looking upstream

WHALLEY



FLOW



Typical condition of soffit masonry with minor isolated spall voids throughout

This feature is dimensioned and highlighted in the anomaly examination report



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PHOTOGRAPHS (DETAIL)

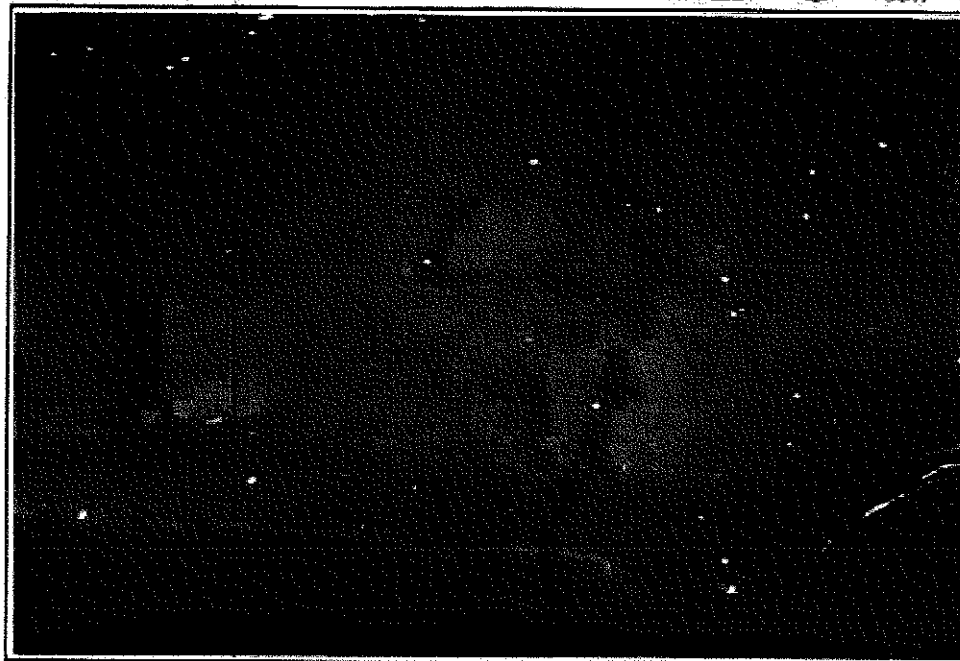
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STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.18 Detail view of bed composition

WHALLEY

FLOW



Exposed bedrock with all grades of gravel present



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16

PHOTOGRAPHS (SUPPLEMENTARY)

FILM : 35mm KODAK EKTAR OSI 200 / 400 on KODAK EHR PAPER TUNGSTEN FLASH / CORRECTIVE FILTERS AS INDICATED
STRUCTURE DIMENSIONS AND FLOW INDICATED IN CHALKED MARKINGS

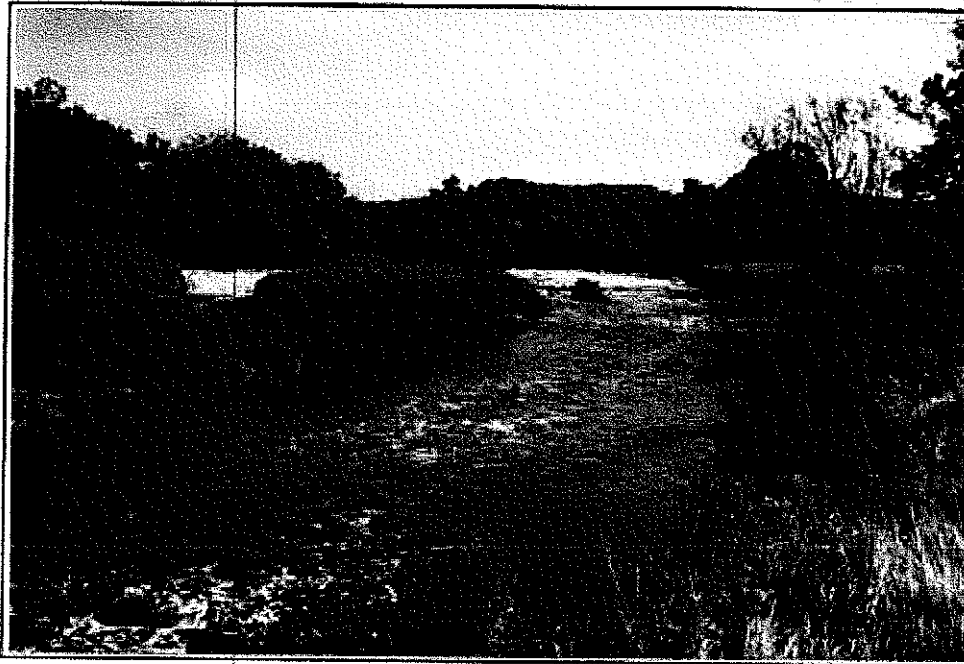
CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

No.A Detail view of upstream watercourse

WHALLEY



FLOW



Upstream weir intact and functional

No.B Detail view of upstream left bank

WHALLEY



FLOW



Collapsed retaining wall partially influencing flow regime



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UNDERWATER PLAN (DECK NOT SHOWN)

PRINCIPLE TOWN : Whalley

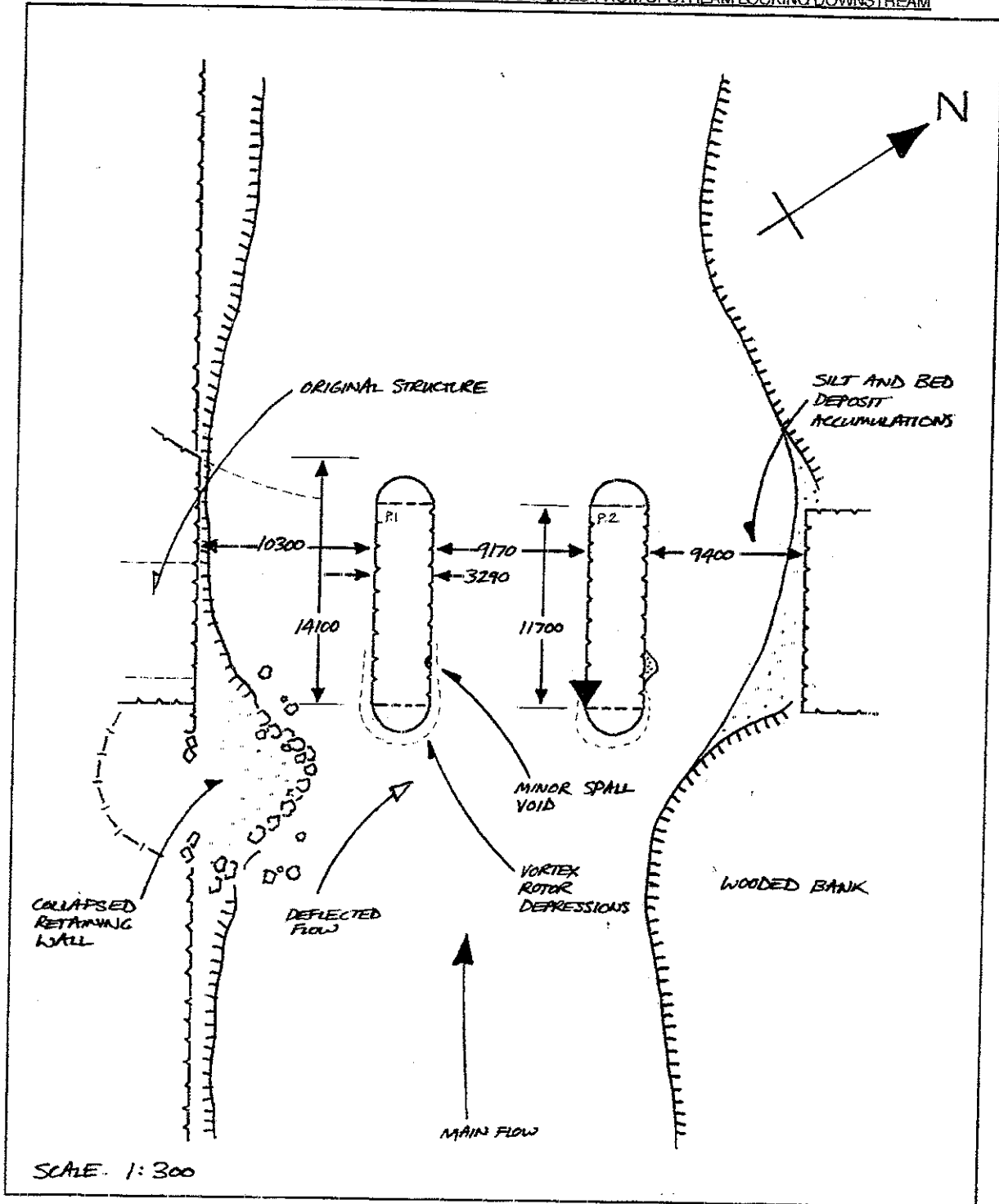
DATUM POINT (▼) : TBM at upstream pier two base of bullnose coping

+2030mm from waterline



DIRECTION

CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM



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18

ELEVATION (UPSTREAM PERSPECTIVE)

PRINCIPLE TOWN : Whalley

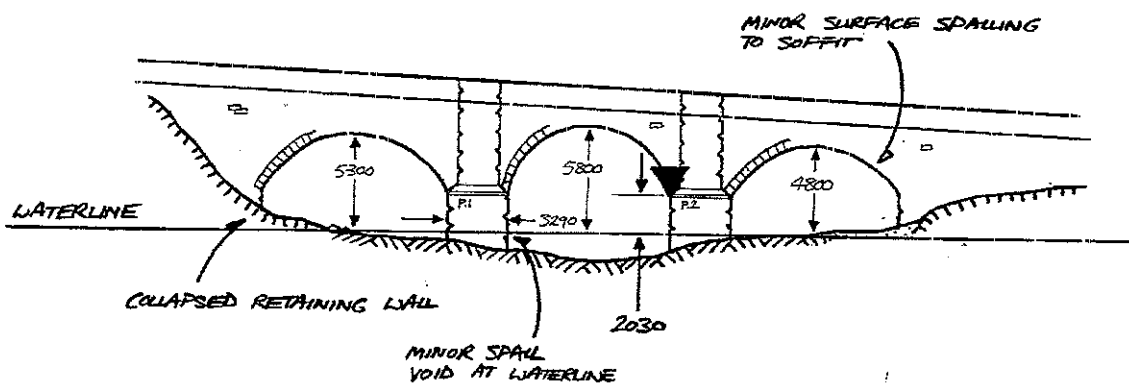


DIRECTION

DATUM POINT (▼) : TBM at upstream pier two base of bullnose coping

+2030mm from waterline

CONVENTION : LEFT AND RIGHT REFERS TO BRIDGE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM



SCALE 1:350



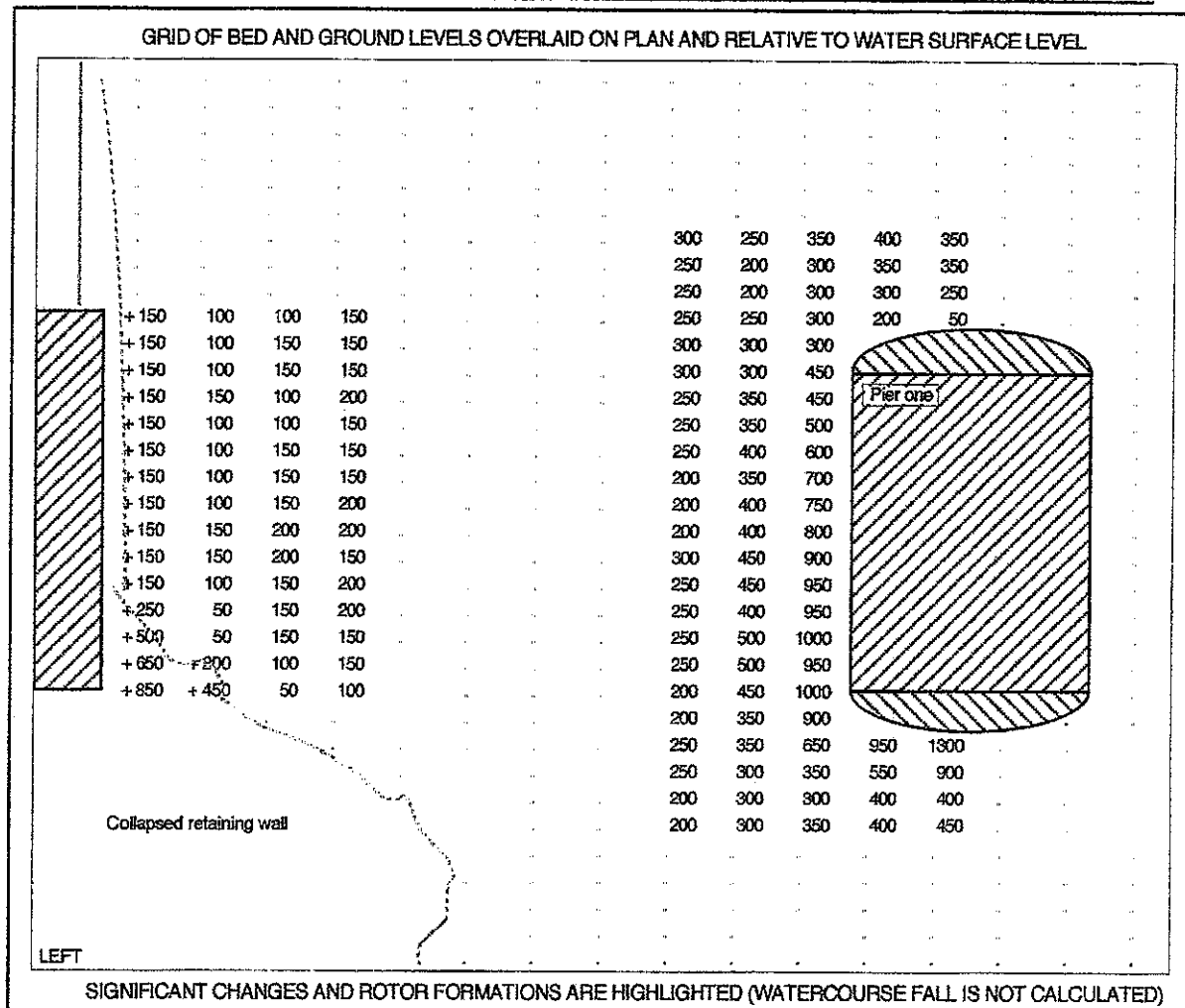
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HYDROGRAPHIC SECTION PLAN (GRID)SCALE: 1m * 1m GRID SQUARE
ALL DIMENSIONS IN mm FROM WATERLINE

FEATURE : LEFT WATERCOURSE

CONVENTION : LEFT AND RIGHT REFERS TO STRUCTURE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

**HYDROGRAPHIC COMPOSITION SAMPLING**

AREA	CLAY	SILT	SAND	GRAVEL FINE	GRAVEL MEDIUM	GRAVEL COARSE	BEDROCK
Midcourse			Present	Present	Predominant	Present	Exposed
Abutments		Predominant	Present	Present	Present	Present	
Upstream		Present	Present	Present	Predominant	Present	
mm	≤0.002	0.002-0.060	0.060-2.000	2-20	20-200	≥200	Geological

GEOLOGICAL NOTES

Stratified sedimentary bedrock exposed across span

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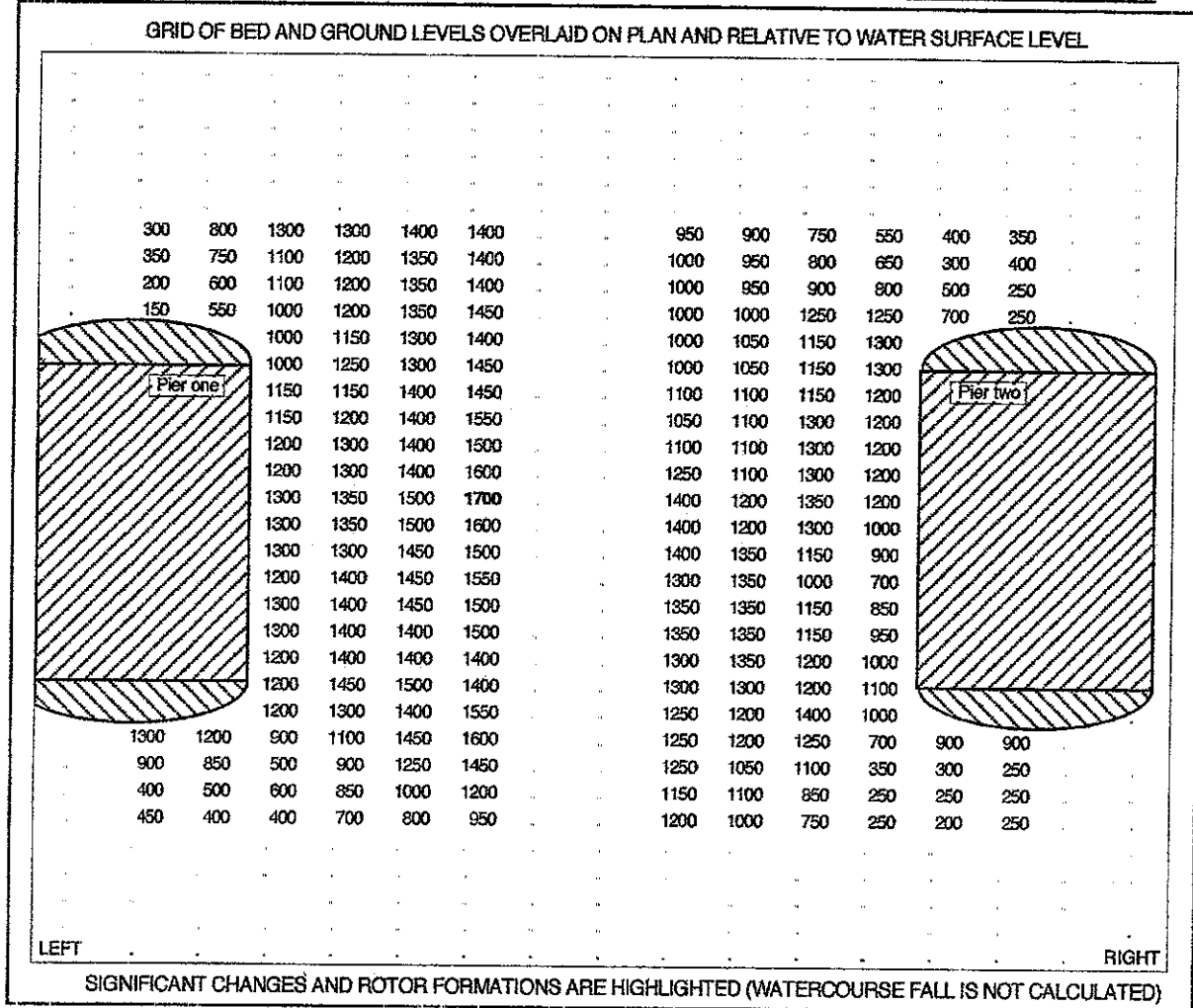
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HYDROGRAPHIC SECTION PLAN (GRID)

FEATURE : MIDCOURSE CENTRELINE

SCALE: 1m * 1m GRID SQUARE
ALL DIMENSIONS IN mm FROM WATERLINE

CONVENTION: LEFT AND RIGHT REFERS TO STRUCTURE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

**HYDROGRAPHIC COMPOSITION SAMPLING**

AREA	CLAY	SILT	SAND	GRAVEL FINE	GRAVEL MEDIUM	GRAVEL COARSE	BEDROCK
Midcourse			Present	Present	Predominant	Present	Exposed
Abutments		Predominant	Present	Present	Present	Present	
Upstream		Present	Present	Present	Predominant	Present	
mm	≤0.002	0.002-0.060	0.060-2.000	2-20	20-200	≥200	Geological

GEOLOGICAL NOTES

Stratified sedimentary bedrock exposed across span

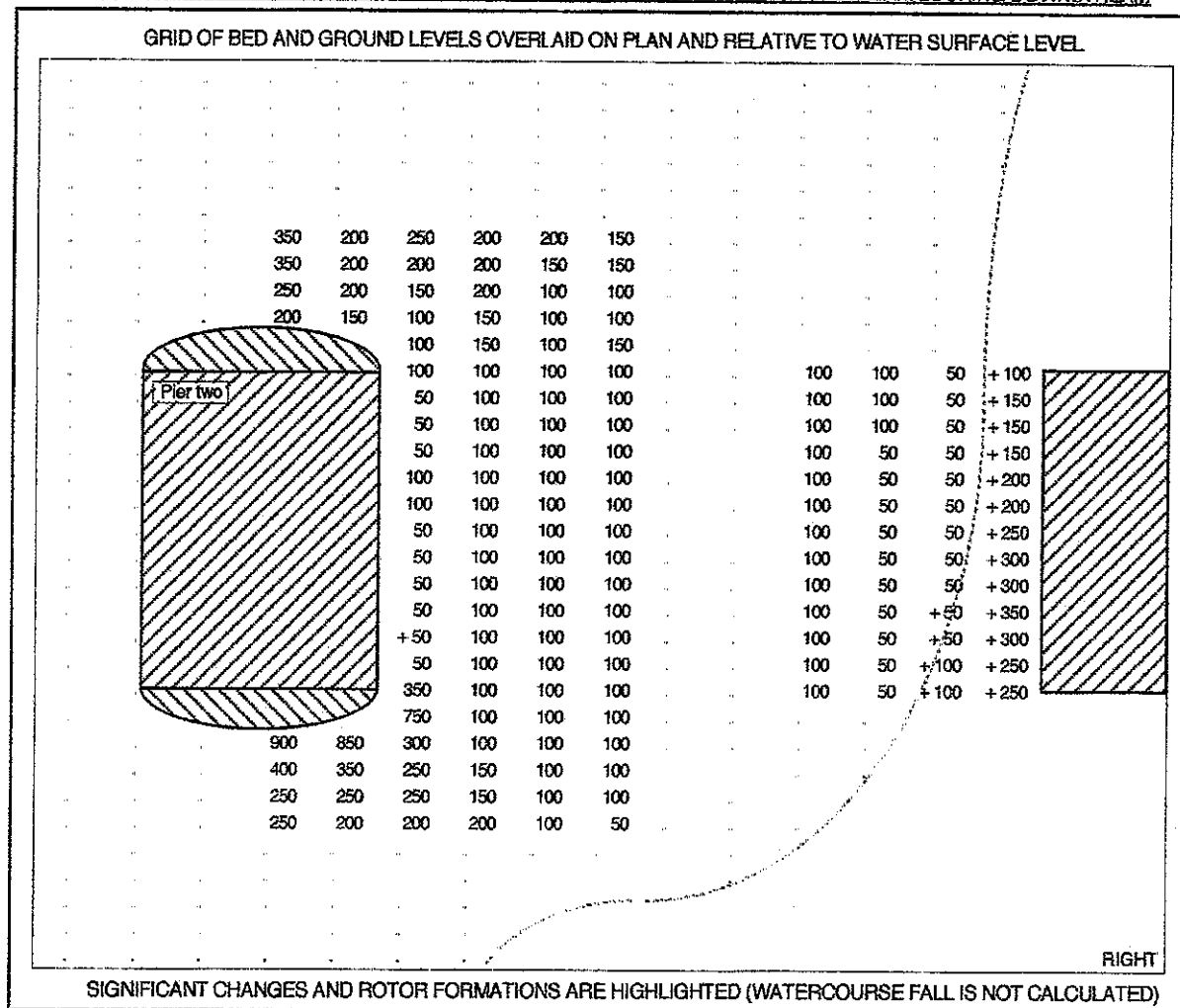
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HYDROGRAPHIC SECTION PLAN (GRID)SCALE: 1m * 1m GRID SQUARE
ALL DIMENSIONS IN mm FROM WATERLINE

FEATURE : RIGHT WATERCOURSE

CONVENTION : LEFT AND RIGHT REFERS TO STRUCTURE AS VIEWED FROM UPSTREAM LOOKING DOWNSTREAM

**HYDROGRAPHIC COMPOSITION SAMPLING**

AREA	CLAY	SILT	SAND	GRAVEL FINE	GRAVEL MEDIUM	GRAVEL COARSE	BEDROCK
Midcourse			Present	Present	Predominant	Present	Exposed
Abutments		Predominant	Present	Present	Present	Present	
Upstream		Present	Present	Present	Predominant	Present	
mm	≤0.002	0.002-0.060	0.060-2.000	2-20	20-200	≥200	Geological

GEOLOGICAL NOTES

Stratified sedimentary bedrock exposed across span

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DIVING STRUCTURAL EXAMINATION REPORT (DESCRIPTIVE)**BRIDGE IDENTITY**

Bridge Name / Designation
Whalley Bridge

Bridge Number / Client Reference
923

Carrying
Unclassified road

Over
River Calder

Road / Line
Dual lane - 'King Street'

Principle Town
Whalley

KP. Reference
Not applicable

ELR. Reference
Not applicable

Grid / Ordinance Survey Reference
SD 373285 435898

Map / Drawing Reference
Landranger 103 / Supplied drawings: LCG/1075

Inspection Date
17.09.98

Previous Inspection
Unknown

BRIDGE DESCRIPTION

Structure Type
Multiple segmental arch

Number of Spans
Three to abutments

Materials : Superstructure
Masonry

Materials : Abutments
Masonry

Materials : Piles / Piers
Masonry

Materials : Invert / Foundations
None / Bedrock foundations

Skew Angle / Curvature (Relative to Minimum Approach)
0° to meandering watercourse, no curvature

DATUM

Datum Location (Indicated on Elevations ▼)
TBM at upstream pier two base of bullnose cap

Datum Level to Water Level at Time of Inspection (+ mm)
+2030mm (Normal autumn flow)

Lowest Bed Level Surveyed to Grid / Location
1700mm span two left of centreline

Average Bed Level Surveyed
1200mm +/- 200mm throughout

UNDERWATER FEATURES

Bed Composition
Silt / Sand / Gravel, Fine - Medium - Coarse

Debris Present
Minor natural flood debris to upstream bullnoses
(Removed at time of inspection)

Marine Growth Type (+ Seasonal Variation)
Green / Brown algae Mossflower

Percentage Area Covered (+ Seasonal Variation)
30% to abutments 10% to downstream left abutment

Thickness (+ Seasonal Variation)
1-2mm 10-20mm

Pollutants (+ Salinity Variation)
None detected

WATER FLOW

Flow Velocity / Susceptibility to flood surge / Meander Attack (See Also Notes)
Moderate flow velocity, occasional seasonal runoff flooding to 2000mm above datum level with surge lasting 10-15 hours

Tidal Conditions / Range (See Also Notes)
None; Inland freshwater site



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DIVING STRUCTURAL EXAMINATION REPORT : DEFECT SUMMARY (INITIAL ANOMALY)**MASONRY CONDITION / MORTAR LOSS**

(See also photograph No 5-16)

Moderate surface mortar loss throughout, primarily to original section 10mm deep at maximum.

MASONRY LOOSE / MISSING

None detected.

SPALLING (AND CAUSE)

(See also photograph No 5-17)

Waterline spall void to pier one upstream right face 200mm wide * 100mm high * 30mm deep at maximum. Isolated minor surface spalling throughout remainder

DRUMMINESS

None detected.

DEFORMATION

None detected.

CRACKS OR FRACTURES

None detected.

CONCRETE WEATHERING

Not applicable.

METALLIC CORROSION

Not applicable.

TIMBER ROT / PROBE DEPTH

Not applicable.

SAMPLES

No core sample boring points were found during inspection.
No samples were taken at the time of inspection

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STRUCTURE CONDITION ASSESSMENT SUMMARY**TREND ANALYSIS / CHANNEL MORPHOLOGY**

(See also hydrographic sections, plan and front diagrams, photograph No.1-4/B)

Profile comparisons are unavailable.

Dynamically stable meandering watercourse.

No significant defects were found.

The collapsed upstream left retaining wall is reported to have been in its present condition for some fourteen years and, while it does not represent an immediate structural concern, it is however, partially affecting the flow regime by concentrating the main flow through the centre span. This channelling creates a greater scour effect on the waterline masonry, bed equilibrium and ultimately the pier foundations, particularly during flood water conditions. Although this is not a short term problem, considerations should be given to rebuilding the retaining wall and clearing debris from the watercourse to enable the flow and resulting forces to balance between spans.

SCOUR (AND VOLUME)

(See also hydrographic sections, plan and front diagrams, photograph No.1-4)

Mobile bed to particle sizes < 0.06mm; Minor suspended load was observed

Evidence of sustained bowave-vortex rotor formation.

Evidence of undercutting risk to structure.

From available data flow is sufficient to present a long term scour risk from seasonal runoff / meltwater flood conditions. Bed equilibrium is such that extensive vortex scour is likely following surges and material is not normally sediment graded.

Banks appear stable with established vegetation and tree growth.

No indications of bank movement was found in the immediate vicinity of the bridge.

AREAS OF SIGNIFICANT DETERIORATION REQUIRING IMMEDIATE SITE NOTIFICATION

No defects assessed to require the immediate notification to Chief Surveyor were found during the inspection.

ASSESSED CONDITION

Bridge in GOOD overall condition

ASSESSED RECOMMENDATIONS

Consider rebuilding the upstream left retaining wall as a preventative measure

This report reflects an initial survey format and all following reports should be anomaly based and comparative using the data from the prior reports to establish a definitive trend analysis for the structure

NOTES / HISTORICAL / SPECIAL FEATURES / CONSTRUCTION DETAILS

Local information suggests that span three is routinely bulldozed to clear bed material and flood debris accumulations.

CONTRACT CONDITIONS

Notes on photographs specific to this contract:

Adverse photographic conditions affecting other structures within the contract schedule do not apply to this report.

**OSIRIS Marine Services Limited**

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INSPECTION ACCESS / QUALITY CHECK / INSPECTION PERSONNEL**EQUIPMENT / ACCESS****Equipment Required For Survey**

Drysuits / Safety harnesses / Survey equipment / Auxiliary lighting (Winter)

Distance And Route of Pedestrian Access From Nearest Support Vehicle Location

Access to upstream left bank 50m from structure and adjacent to residential property. Parking beside private garage.

Special Permission Contact / Conditions

Contact adjacent residents for parking permission and as a courtesy.

PROOFING**Inspection Compilation**

Mark Wright

Quality Proofing

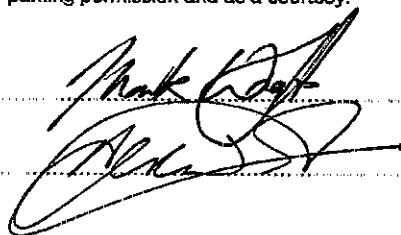
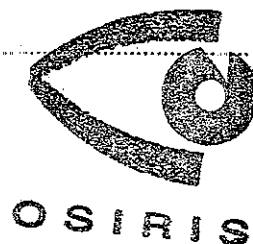
Aiden C R West

Contract Identity

LCC Group J

Report Date

3 December 1998

Original Report where endorsement is in green

PERSONNEL

Aiden West	HSE I Diver / DMT Medic / Diving supervisor	OSIRIS Director
Noel Spalding	B.Tec ,BA., MSc(Econ),PgD., MBInstNDT. CSWIP 3.4u Controller	OSIRIS Coordinator
Mark Wright	HSE I Diver / Inspection Specialist / Diving supervisor	Inspection Manager
Chris Ellis	HSE I Diver / Inspection Specialist	

QUALITY ASSURANCE

OSIRIS continually attempt to offer the highest standards of survey and inspection available to the Inshore Civil Construction and Diving Industry which can meet or exceed all current professional standards in all forms of NDT inspection.

If you have any further questions of any kind, comments or enquiries relating to this report, its relating remedial recommendations or techniques relevant to this or any other structure, please telephone our main office below.

If you wish to consult directly with the the OSIRIS author of this survey and the inspector *personally present and responsible* for its inspection, Please telephone at any time Mark Wright directly on 0113 - 2178254 or 0385 - 738079 (24 Hour mobile).

**OSIRIS Marine Services Limited**

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26

CLIENT NOTES



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