



THE GOODSYARD

Structural Engineering Condition Survey Report

September 2019



ballymore.



BISHOPSGATE GOODSYARD

PREFACE

This is a structural visual condition survey report of the existing structures on the Bishopsgate Goodsyrd site undertaken on 15th & 18th February 2019 prepared by WSP.

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THE GOODSYARD

1.1 EXECUTIVE SUMMARY

A visual condition due diligence survey of the existing structures on the Bishopsgate Goodsyards site was undertaken by WSP on 15th & 18th February 2019. Two previous condition surveys were undertaken by Alan Baxter Associates in 2009 & 2013.

The previous Alan Baxter reports were used as a basis to assess and record if the condition of the structures have changed over a 6-year period since the 2013 Alan Baxter report.

The findings and recommendations within this report are based on visual observations from ground level of the following areas undertaken on 15th & 18th February 2019 and summarised below:

- Grade II Listed Braithwaite Arches and Adjacent 1860 & 1880 Arches
- London Road Upper Jack Arch Deck
- Oriel Gateway / Western Arches
- Sclater Street boundary wall

Grade II Listed Braithwaite Arches

Based on the Alan Baxter 2009 and 2013 photographic evidence there is no obvious signs of any change in the Braithwaite arch structure and as previously recorded they appear to be in good condition for their type and age.

Adjacent southern 1860 & 1880 Arches

Historic settlement and water ingress of the adjacent 1860 and 1880 southern arches was evident, as previously recorded in the Alan Baxter 2009 and 2013 reports.

Based on the photographic evidence from the Alan Baxter reports it is difficult to assess if the localised water ingress seeping through from above and through the joints has increased / intensified. There are several locations where weathered brickwork and efflorescence (crystalline salts deposits) forming on the brickwork due to water ingress were evident.

Some localised damage to the brickwork probably from previous uses was evident as was loose or missing brickwork.

The arches are considered to be in reasonable condition for their type and age. In order to prevent further weathering / deterioration of the brickwork its recommended the water ingress through the arches is addressed.

London Road- Upper Jack Arch Deck Structure

The upper jack arch deck over London Road was constructed circa 1880's and consists of a series of brick arches spanning between built up rivetted iron/steel beams. The jack arch structure is generally in very poor condition with the southernmost exposed side of the structure, at the edge of the viaduct most evident with regards to corrosion and steel deterioration. Based on the Alan Baxter 2013 report along with evidence of spalling corroded steelwork on the deck below, we believe significant further deterioration of steel sections due to water penetration has taken place over the past 6 years.

Access was gained to the upper most deck above London road via the ramp above the Sliver arches where overgrow shrubbery, trees, demolished building material and general fill material were observed, this was substantial in areas approximately 2.0m deep.

Due to the substantial loss of steel to some of the members combined with continued deterioration due to water ingress, we are of the opinion in order to avoid the potential risk of structural failure to the worst corroded areas temporary propping to these beams should be undertaken as soon possible combined with the removal of the fill material currently surcharging the jack Arch structure.

In 2009 Alan Baxter due to the corrosion issues proposed a possible solution where the existing steel beams remain in place and are hung from a new reinforced concrete structure installed above the beams. Due to the continued corrosion since 2009 and based on our observations the viability of this solution needs to be reviewed.

Oriel Gateway and Western arches

We were unable to gain access to the stone Oriel which is currently enclosed and protected by hoarding. Whilst the hoarding was removed from some of the western arches whilst we were in attendance on site to allow Plowman Craven to undertake a topographical survey we were unable to gain access due to the arches being filled with general building material / rubbish with the exception of the viaduct structure supporting the Oriel which was originally the entrance to the Bishopsgate Goodsyards Depot.

The supporting steel beams to the underside of the structure as previously recorded by Alan Baxter in 2013 are in poor condition with some of the beams severely corroded and delaminated. It was not evident from ground level based on the previous photographic evidence that the rate of corrosion had accelerated over the past 6-year period.

We concur with the previous Alan Baxter previous findings, due to the extensive corrosion of the steel members they will need to be strengthened / replaced. All efforts in the first instance will be taken to undertake this work leaving the Oriel insitu.

Sclater Street Boundary Wall

The northern elevation of the masonry wall inspected from Slater Street visually appears to be plumb with no major structural signs of movement due to settlement. Based on previous photographic evidence the condition does not appear to have changed over the past 6 years with the exception of increased vegetation growing out through the wall causing minor cracking to masonry joints and loosening / spalling of brickwork.

It was previously recorded in 2013, temporary timber propping to the damaged pier and surrounding brickwork above the seventh arch west of Braithwaite street (formally known as Wheeler Street) had been installed and remedial repairs were needed. The timber propping is still in place with no remedial works having been undertaken. We would recommend as per Alan Baxter report that these works are undertaken as soon as possible.

1.2 INTRODUCTION

WSP were appointed by Hammerson & Ballymore to undertake a structural engineering condition survey of the existing structures on the Bishopsgate Goodsyards site. This follows two previous condition survey reports undertaken by Alan Baxter Associates in 2009 and 2013.

The site is bounded by the railway lines into Liverpool Street to the south and extends to the east adjacent Brick Lane. The Western boundary fronts both Commercial Street and Shoreditch High Street and to the North adjacent Bethnal Green Road & Sclater Street.

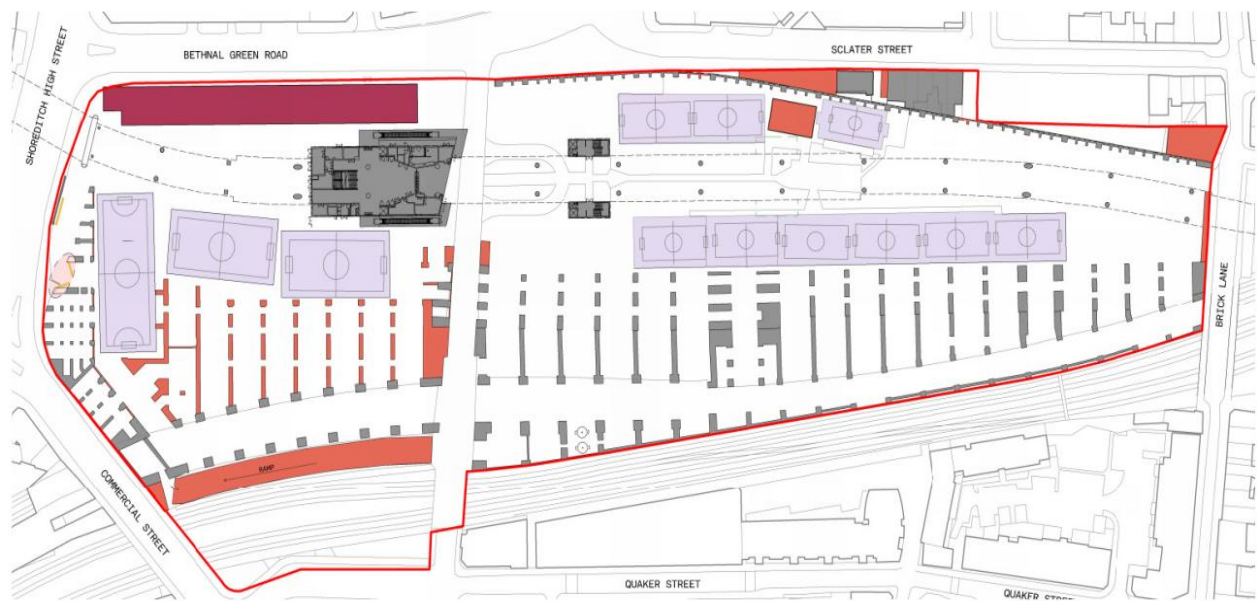


Figure 1-1 Site Location Plan

The previous Alan Baxter reports have been used as a basis to assess and record if the condition of the structures have changed over a 6-year period since the 2013 Alan Baxter report.

The findings and recommendations within this report are based on visual observations from ground level of the following areas undertaken on 15th & 18th February 2019:

- Grade II Listed Braithwaite Arches and Adjacent 1860 & 1880 Arches
- London Road Upper Jack Arch Deck
- Oriel Gateway / Western Arches
- Sclater Street boundary wall



Figure 1-2 Location Plan of Existing structures

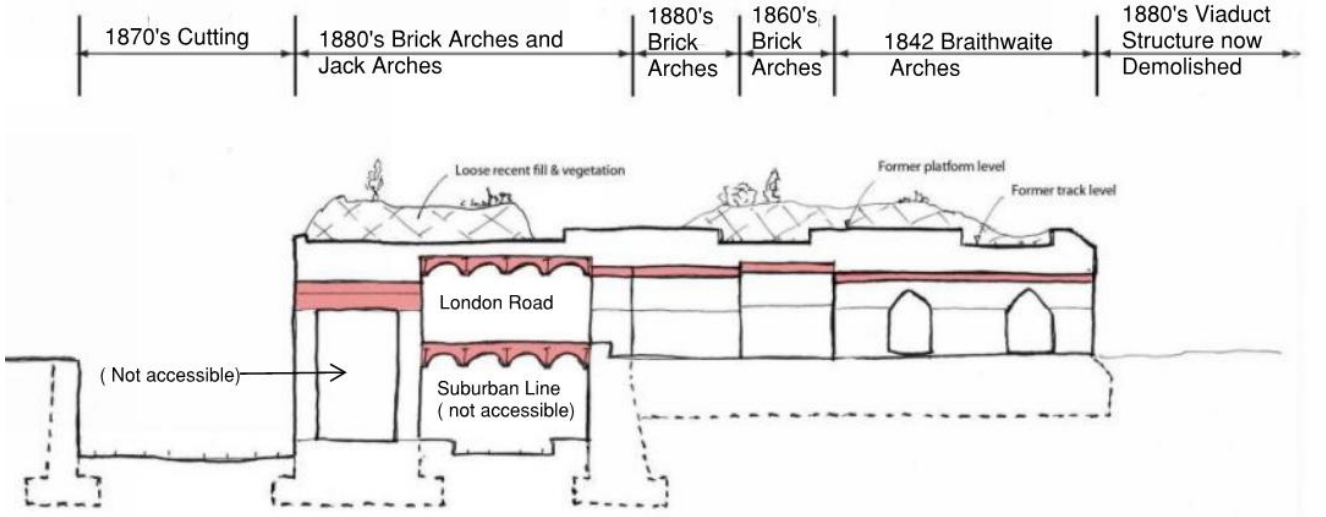


Figure 1-3 Section North to South looking West

1.3 BRAITHWAITE ARCHES AND ADJACENT 1860 & 1880 ARCHES

Alan Baxter observations 2009 & 2013

The Alan Baxter 2009 report recorded the Braithwaite arches generally appeared to be in good condition for its age and type, with no obvious signs of settlement, cracking or frost damage to the brickwork and very few signs of water ingress from above. Some localised damage to the brickwork was evident from previous uses.

Historic settlement of the adjacent 1860 and 1880 southern arches was evident and had in various locations rotated away from the Braithwaite arches with associated cracking at the ends of some of the arches at their junction with London Road structures. Water ingress was noted as being more significant than the Braithwaite arches and again some localised damage to the brickwork was evident from previous uses.

Observations from the 2013 Alan Baxter report stated there were no obvious signs of any change in the condition of the Braithwaite viaduct structure since their 2009 report.

Water ingress through the adjacent arches was still evident seeping through from above and through the joints between the different phases of construction. Further locations on the arch soffits where locally bricks were loose or missing were recorded.

WSP 2019 observations

Based on the Alan Baxter 2009 and 2013 photographic evidence there is no obvious signs of any change to the Braithwaite arch structure and as previously recorded they appear to be in good condition for their type and age. Localised signs of water ingress from above were evident, as was localised minor cracking of the brickwork which is not considered to be structurally significant.

Historic settlement and water ingress of the adjacent 1860 and 1880 southern arches was evident, as previously recorded in the Alan Baxter 2009 and 2013 reports as was potentially associated cracking at the ends of some of the arches at their junction with London road. There was no evidence to suggest any further settlement had taken place. Water ingress seeping through from above and through the joints was more significant compared to the Braithwaite arches and could be an additional factor in addition to the historical settlement causing cracking at the ends of the arches. It is difficult to assess if the water ingress has increased / intensified over the past 6 years based on available historic photographic evidence.

There are several locations where weathered brickwork and efflorescence (crystalline salts deposits) forming on the brickwork has occurred over a period of time due to water ingress.

Some localised damage to the brickwork probably from previous uses was evident as was loose or missing brickwork.

The arches are considered to be in reasonable condition for their type and age. In order to prevent further weathering / deterioration of the brickwork its recommended the water ingress issues are addressed.

Refer to figure 2-1 below for photographic location plan.

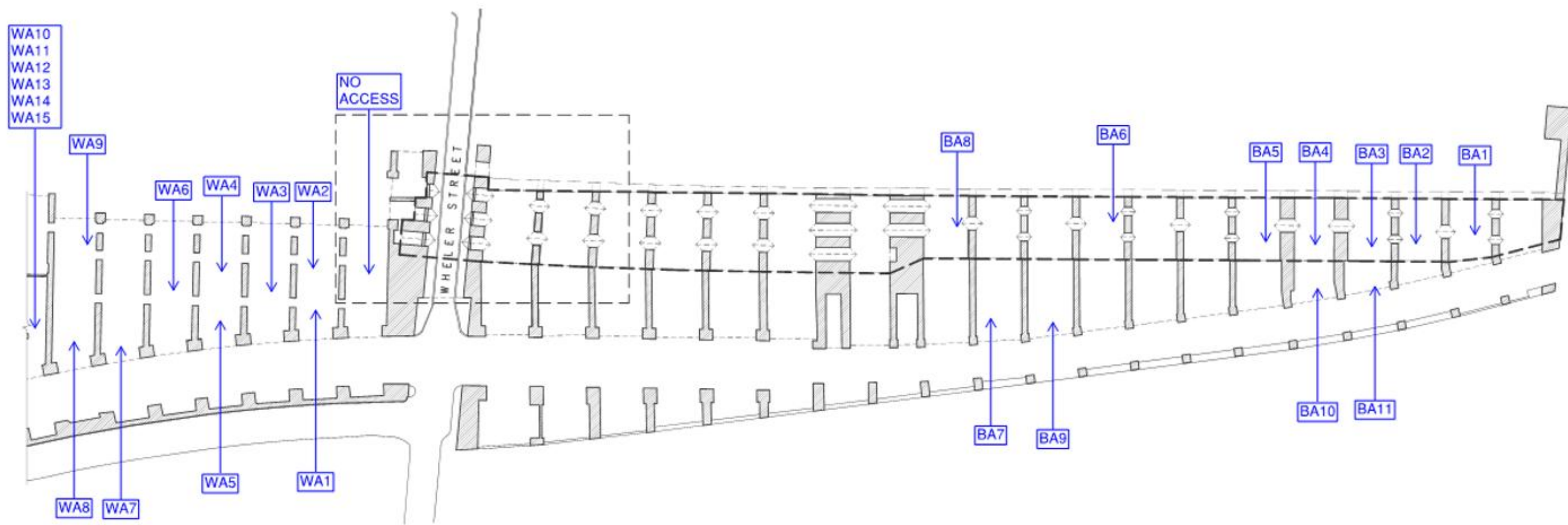


Figure 2-1 Photographic location Plan (Eastern & Western Braithwaite and adjacent Southern Arches)



BA1: Historic modification to Braithwaite Arch



BA2: Minor Cracking to soffit of arch



BA3: Weathered Brickwork Braithwaite Arch



BA4: Historic Settlement



BA5: Historic Settlement to 1860's Arch



BA6: Staining / Efflorescence of Brickwork



BA7: Weathering of brickwork due to water ingress



BA8: Localised damage to Braithwaite Arch



BA9: Cracking due to historic settlement of 1880's arch at junction with jack arch structure.



BA10: Weathered brickwork of 1880 arch at junction with Jack Arch due to water ingress



BA11: Weathered brickwork of 1880 arch at junction with Jack Arch due to water ingress



WA1: Water ingress through Arch



WA3: Minor Cracking & Water ingress



WA5: Weathered brickwork due to water ingress



WA2: Braithwaite Arch



WA4: Minor cracking at crown of arch



WA6: modifications to arch from previous use



WA7: Arch dry no water ingress



WA8: Water ingress through arch



WA9: Efflorescence (crystalline salts deposits)



WA10: Water ingress through arch



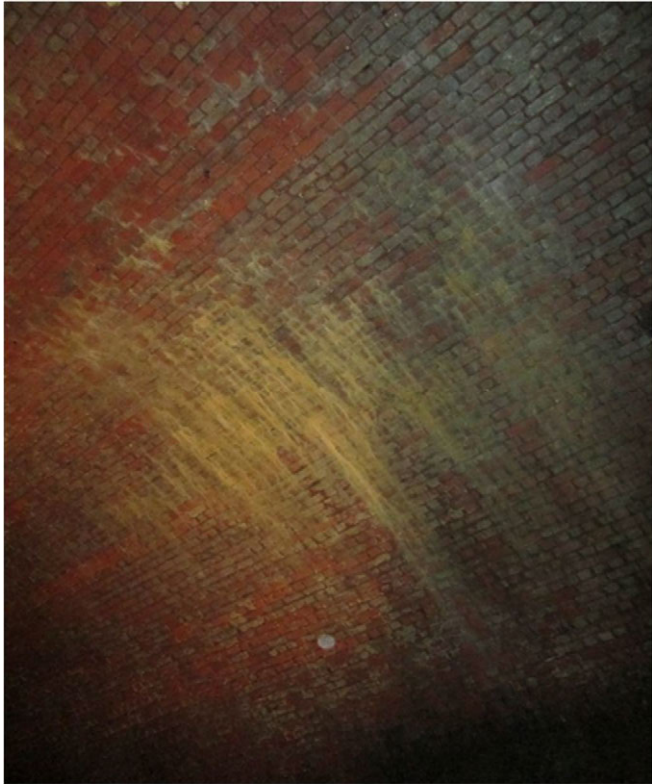
WA11: Modification to arch & water ingress



WA13: Brick end wall cracking and intermediate timbers rotting



WA15 Weathered brickwork due to water ingress



WA12: Severe Water ingress through arch



WA14: Minor water seepage through crown of arch

1.4 LONDON ROAD-UPPER JACK ARCH DECK STRUCTURE

Alan Baxter observations 2009 & 2013

The jack arch section over London Road was constructed in the 1880's and consists of a series of brick arches spanning between built up rivetted iron/steel beams.

The Alan Baxter 2009 report noted that whilst the masonry elements of the jack arch structure spanning between the riveted beams were in reasonable condition, significant corrosion of the beams was evident.

The Alan Baxter 2013 report states the Jack Arch structure is in extremely poor condition with further deterioration of the jack arch beams and supporting beams having taken place. Where water continues to penetrate the structure very significant loss to sections of the beams is apparent. The worst of the corrosion was noted as being along the southern most exposed side of the structure, to the edge of the viaduct. Concern was expressed at the extent and ongoing deterioration and it was recommended temporary support be provided to the worst affected beams.

WSP 2019 observations

As previously reported by Alan Baxter, whilst the masonry elements of the jack arch structure are in reasonable condition there are numerous locations where the steel / iron members are in extremely poor condition.

Based on Alan Baxter 2009 and 2013 photographic evidence and a marked-up condition plan summarising the condition of the viaduct structure, it's evident further continued deterioration of the steel members has taken place over the past 6 years due to continued weathering / water penetration.

Access was gained to the top of the upper most deck above London road via the ramp above the Sliver arches where overgrow shrubbery, trees, demolished building material and general fill material were observed, this was substantial in areas approximately 2.0m deep.

Due to the substantial loss of steel to some of the members combined with the ongoing continued deterioration due to water ingress, we are of the opinion in order to avoid the potential risk of structural failure to the worst corroded areas temporary propping to these beams should be undertaken as soon possible combined with the removal of the fill material above currently surcharging the jack Arch structure.

Alan Baxter 2009 report due to the corrosion issues, proposed a possible solution where the existing steel beams remain in place and are hung from a new reinforced concrete structure installed above the beams which is supported off the existing masonry piers. Due to the continued corrosion the viability of this solution will need to be reviewed further when the re-development works of this area are programmed to be undertaken, as it may be structurally more viable due to the ongoing deterioration to remove and replace the worst corroded areas.



Image indicating falling corroded steel from beam above

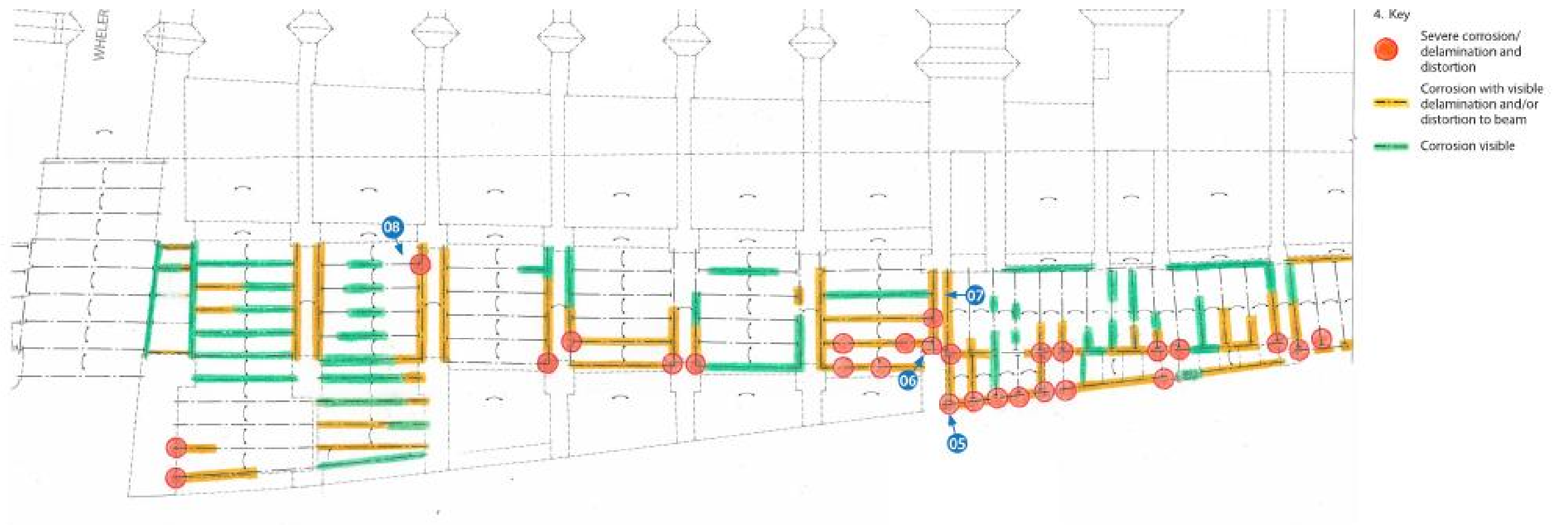
The Alan Baxter 2103 report included colour coded key plans to help summarise the condition of the existing iron / steel beams. Below are the 2103 colour coded extracts from the report with updated key plans from our observations along with photos taken during our visit which help explain and compare the condition and deterioration of the beams since 2013.

Fig 1.4.1: Extract Alan Baxter 2013 report Condition Plan London Road Deck Structure sheet 1 of 3





Fig 1.4.2: WSP observations 2019 Condition Plan London Road Deck Structure sheet 1 of 3



October 2013

BISHOPSGATE GOODS YARD
EXISTING VIADUCT CONDITION REPORT

STREET LEVEL PLAN SHOWING
DECK STRUCTURE CONDITION
SURVEY ABOVE LONDON ROAD
SHEET 2 OF 3

Fig 1.4.3: Extract Alan Baxter 2013 report. Condition Plan London Road Deck Structure sheet 2 of 3



Fig 1.4.4: WSP observations 2019 Condition Plan London Road Deck Structure sheet 2 of 3

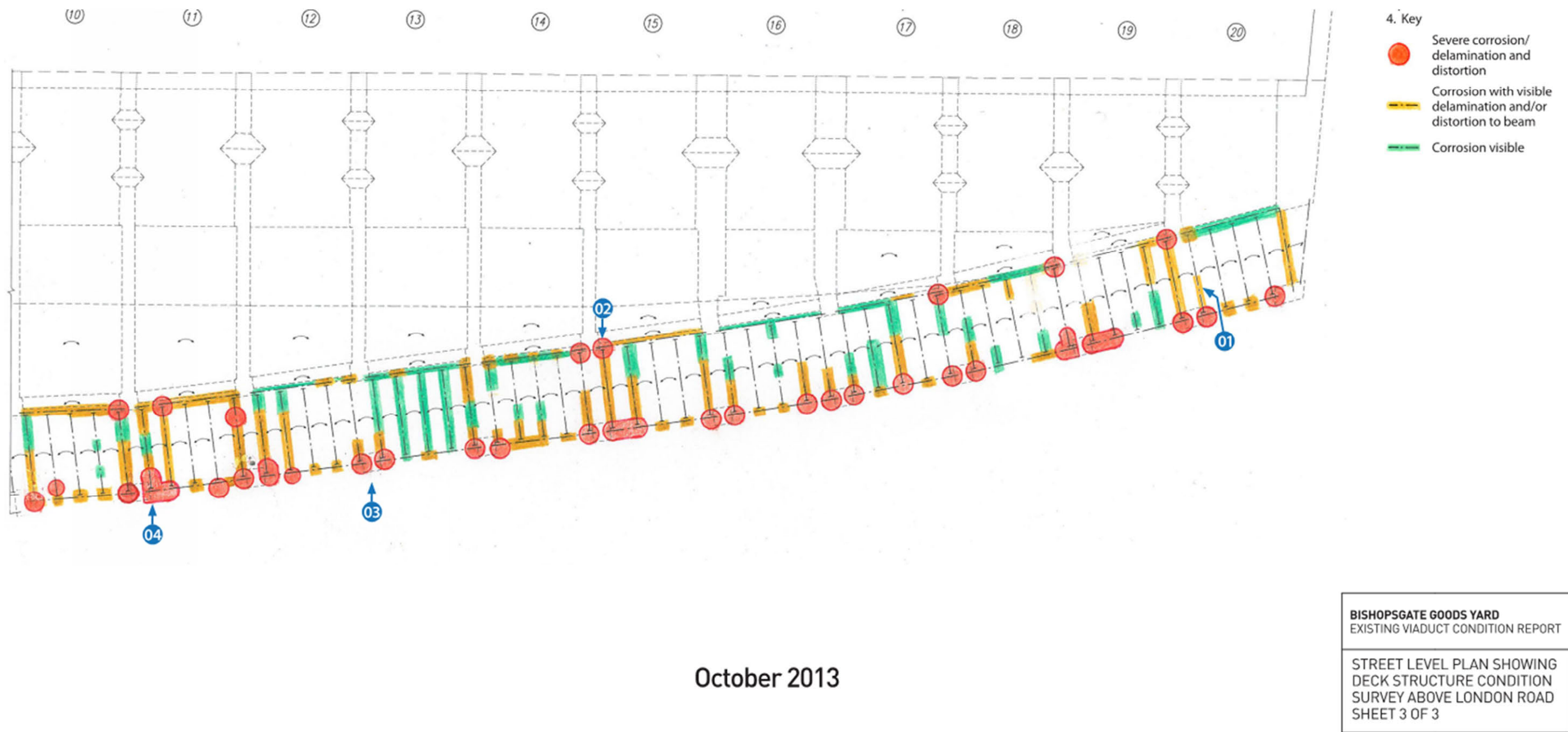


Fig 1.4.5: Extract Alan Baxter 2013 report. Condition Plan London Road Deck Structure sheet 3 of 3

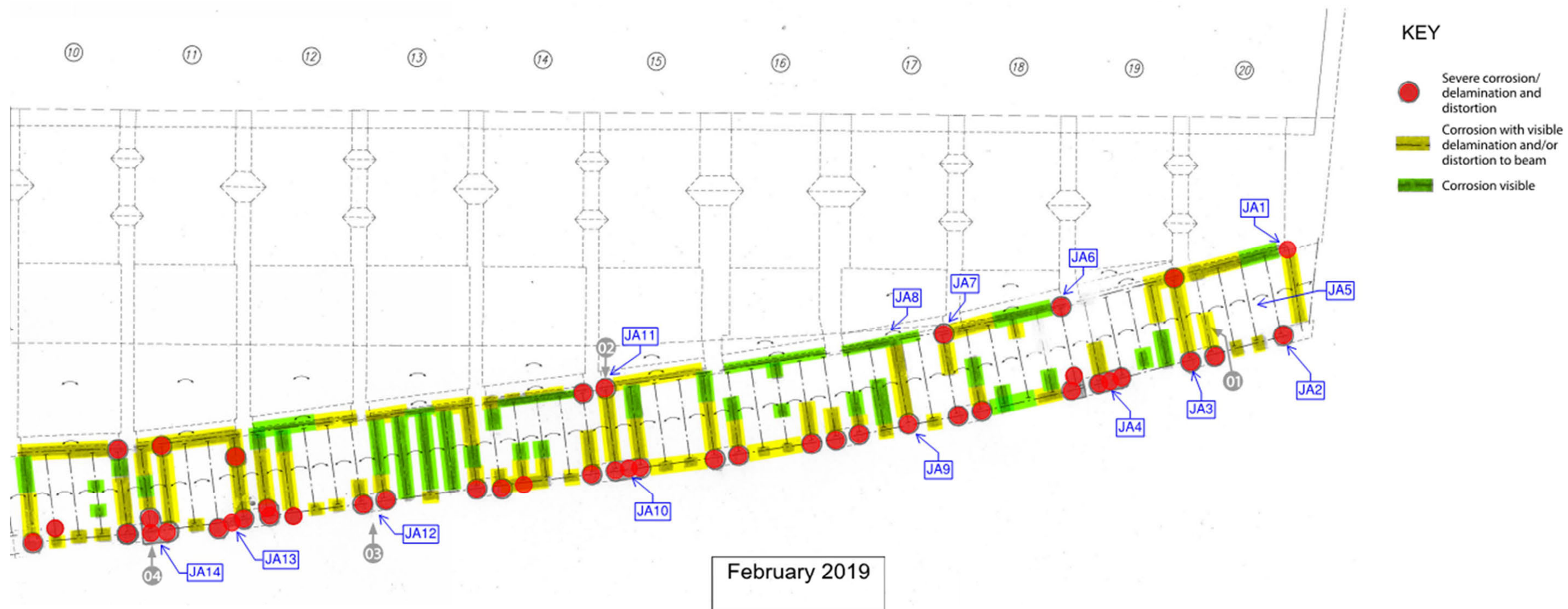


Fig 1.4.6: WSP observations 2019 Condition Plan London Road Deck Structure sheet 3 of 3



JA1 Severe corrosion to beams at supports



JA3 Severe corrosion and delamination



JA4 Severe corrosion and delamination



JA2 Severe corrosion and distortion at end of beam



JA5 Brick Arches general in reasonable condition



JA7 Severe corrosion to bottom flange of beam



JA9 Severe Corrosion and delamination to end of beam



JA6 Severe corrosion and distortion at end of beam



JA8 Corrosion visible with distortion of beam at support



JA10 Large section of bottom flange eroded away at support



JA11 Severe corrosion and delamination to bottom flange



JA13 Severe distortion and corrosion of bottom flange



Corrosion visible

JA15



JA12 Delamination and distortion of bottom flange



JA14 Severe corrosion and delamination of beams at support



JA16 Severe corrosion and delamination to bottom flange



JA17 Bottom flange of beam corroded away



JA19 beam corroded / delaminated



JA21 Beam severely corroded and delaminated



JA18 Arch structure dry and in good condition



JA20 Corrosion visible intersection Jack arch and southern arches



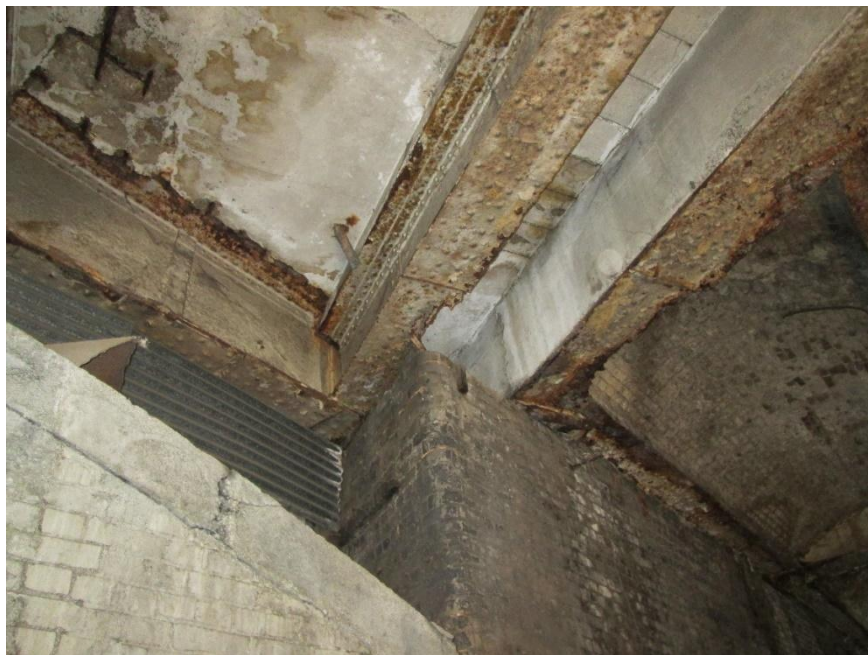
JA22 Beam severely corroded and distorted



JA23 Web at intersection of bottom flange severely corroded



JA25 Severe corrosion of beam at support.



JA24 Beams severely corroded and bottom flanges eroded away

1.5 ORIEL GATEWAY AND WESTERN ARCHES

Alan Baxter observations 2013

The Alan Baxter 2013 report states the Listed Oriel is in very poor condition with large parts of the stonework having eroded with numerous cementitious repairs evident.

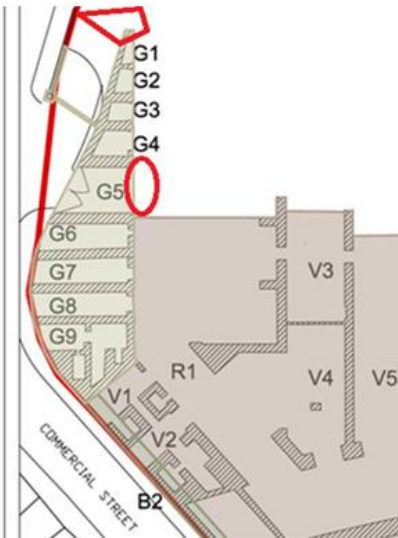
The supporting structure iron / steel beams to the underside of the Oriel appeared to be severely corroded and delaminated, it was recommended that temporary support be provided to those beams.

It was further stated that the appropriate approach may be for the Oriel structure to be carefully dismantled and refurbished by a specialist which would enable uncomplicated access to the iron / steel beams supporting the Oriel to be repaired or replaced.

Access was not obtained to the Commercial Street Arches, it was however observed from the street that there was some general spalling along the length of the brickwork probably caused by freeze/thaw action. Bulging of the brickwork on the curved section of the wall fronting Commercial Street was also evident

WSP 2019 observations

We were unable to gain access to the stone Oriel which is currently enclosed and protected by hoarding. Whilst the hoarding was removed from some of the western arches fronting Commercial Street and Shoreditch high Street whilst we were in attendance on site to allow Plowman Craven to undertake a topographical survey we were unable to gain access due to the arches being filled with general building material / rubbish with the exception of the viaduct structure (G5 noted in figure 4-1 below) supporting the Oriel which was originally the entrance to the Bishopsgate Goodsyrd Depot.



Western arches / viaduct structure

The supporting steel beams to the underside of the structure as previously recorded by Alan Baxter in 2013 are in poor condition with some of the beams severely corroded and delaminated. It was not evident from ground level based on the previous photographic evidence that the rate of corrosion had accelerated over the past 6-year period.

We concur with the previous Alan Baxter findings, due to the extensive corrosion of the steel members they will need to be strengthened / replaced. All efforts in the first instance will be taken to undertake this work leaving the Oriel insitu.

the appropriate approach would be for the Oriel to be carefully dismantled / removed and potentially refurbished by a specialist which would enable access to the steel supporting beams supporting the deck so the corroded beams can either be repaired or replaced.



Severely corroded steel under Oriel

Severely corroded primary and secondary steel under Oriel



View into original depot entrance

1.6 SCLATER STREET BOUNDARY WALL

Alan Baxter observations 2013

Alan Baxter reported the substantial approximately 1.8 metres thick masonry wall appeared to be reasonably plumb with no visible signs of cracking to suggest any movement due to settlement of the existing foundations. Spalling brickwork was also recorded likely due to freeze thaw action.

WSP 2019 observations

The northern elevation of the masonry wall inspected from Slater Street visually appears to be plumb with no major structural signs of movement due to settlement. Based on previous photographic evidence the condition does not appear to have changed too much over the past 6 years except for increased vegetation growing out through the wall causing minor cracking to masonry joints and loosening / spalling of brickwork.

It was previously recorded in 2013, temporary timber propping to the damaged pier and surrounding brickwork above the seventh arch west of Braithwaite street (formally known as Wheeler Street) had been installed and remedial repairs were need. The timber propping is still in place with no remedial works having been undertaken. We would recommend as per Alan Baxter report that these remedial works are undertaken as soon as possible along with the treatment / removal of the vegetation through the wall.



Timber propping to damaged pier requiring repair



Vegetation growing through wall causing damage to brickwork

ballymore.



Hammerson