

TORBAY COUNCIL

**TWEENAWAY CROSS - JUNCTION  
IMPROVEMENT SCHEME**

TUE 43519/15.1/1/0

February 04



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Figure 3 - Layout of Tweenaway Cross  
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Appendix1 – Indicative Plans of Junction Improvements

- 2.3.5 All the approaches to the junction are subject to a 30mph speed restriction.

## 2.4 Existing Traffic Flows

- 2.4.1 A full junction count at Tweenaway Cross was completed in 2001. The results of this are shown in Table 1 below. The main movements are between Brixham Road and Kings Ash Road with approximately 700 vehicles per hour in both the morning and evening peak. A more detailed examination of the flows shows the other turning movements are fairly well balanced with relatively high right turn movements and no substantial difference between the morning and evening peak.

AM Peak	A380 Kings Ash Rd	A3022 Totnes Rd (E)	A3022 Brixham Rd	A385 Totnes Rd (W)	Total
A380 Kings Ash Rd	0	70	509	434	1013
A3022 Totnes Rd (E)	100	0	61	330	491
A3022 Brixham Rd	737	314	0	24	1075
A385 Totnes Rd (W)	175	201	184	0	560
<b>Total</b>	<b>1012</b>	<b>585</b>	<b>754</b>	<b>788</b>	<b>3139</b>
PM Peak	A380 Kings Ash Rd	A3022 Totnes Rd (E)	A3022 Brixham Rd	A385 Totnes Rd (W)	Total
A380 Kings Ash Rd	0	106	741	248	1095
A3022 Totnes Rd (E)	165	0	65	229	459
A3022 Brixham Rd	802	305	0	35	1142
A385 Totnes Rd (W)	255	271	272	0	798
<b>Total</b>	<b>1222</b>	<b>682</b>	<b>1078</b>	<b>512</b>	<b>3494</b>

Table 1 – AM and PM peak flows 2001

- 2.4.2 It should be noted that these counts were undertaken before Battersway Road was closed to through traffic, and therefore the right turn from Totnes Road (E) to Brixham Road may be under-represented by this count.
- 2.4.3 To take account of this it has been assumed that the flows between Totnes Road East and Brixham Road are fairly balanced between the AM and PM peak, therefore the AM peak from Totnes Road has increased to around 300 vehicles to match the return flow in the PM peak. Likewise the PM peak movement from Totnes Road East to Brixham Road has been increased to around 300 vehicles to match the corresponding flow in the AM peak.
- 2.4.4 Congestion is experienced at the junction now in peak periods and throughout the summer months, which indicates that the junction is operating at its design capacity.
- ## 2.5 Seasonal Variation
- 2.5.1 An important factor in the Torbay area is the high seasonal variation in traffic flows. Automatic Traffic Count (ATC) data for the A380 south of Gallows Gate indicates that flows increase in August in comparison to October by 3% in the AM peak, 11% in the PM peak and are generally 15% higher over the whole day (refer to Figure 3 of CD23/6).



- 2.5.2 The AM peak in the summer months does not increase substantially compared to October due to reduced commuting due to holidays and a lack of school traffic. The PM peak demand in the summer is generally higher, which relates to tourist traffic. Any tests of junction capacity improvements will have to take this into account.

## 2.6 Capacity of Approach Roads

- 2.6.1 Traffic approaching the junction at Tweenaway Cross will be restricted by the capacity of the approach roads and these will limit any capacity gained by a junction improvement. The capacities of the approach roads have been compared to Table 2 of TA79/99 Volume 5 of the Design Manual for Roads and Bridges (DMRB). A brief assessment of the capacity of these links in comparison to their existing flows is given in the table below:

Link	Existing Flows (2001 Observed)		Link Capacity (DMRB TA 79/99)
	AM Peak	PM Peak	
Kings Ash Hill	1013	1095	1300
Totnes Road East	791	759	1300
Totnes Road West	560	526	1300
Brixham Road	1075	1142	1900

Table 2 – Link Capacities of Approach Roads

- 2.6.2 This indicates that the approach from Kings Ash Road is approaching its link capacity in the peak periods.
- ## 2.7 Pedestrian and Cyclist facilities
- 2.7.1 Pedestrians have been provided with footpaths on all of the immediate approaches to the junction. No formal provision for cyclists has been given at the junction.
- 2.7.2 All four arms of the junction have footpaths running on both sides of the carriageway. Since the 1996 Inquiry, improvements have been made at the junction to improve conditions for pedestrians using the junction at all arms at the junctions excluding Totnes Road East, which has no formal pedestrian crossing provision.
- 2.7.3 There is a formal provision for pedestrians on three arms of the junction. The three arms with a signalised crossing facility are the A380 Kings Ash Hill, the A3022 Brixham Road and the A385 Totnes Road. The arm without any formal crossing facility is the A3022 Totnes Road. The signalised arms of the junction provide a central waiting island provided as a staggered layout, with pedestrians having to cross the road in two stages. Although this is good for capacity it is relatively poor for pedestrians. As a result, it has been observed on site that this facility is not always used particularly when the pedestrian flow is high due to the local schools in the area.

- 2.7.4 A pedestrian count at the junction was undertaken in January 2004 in the peak periods. The results of this count are shown in Table 3 below:

AM (8:00 - 9:00)	A	B	C	D	TOTAL
Corner of Kings Ash Road and Totnes Road W (A)	-	12	-	97	109
Corner of Kings Ash Road and Totnes Road E (B)	105	-	17	-	122
Corner of Totnes Road E and Brixham Road (C)	-	6	-	58	64
Corner of Brixham Road and Totnes Road W (D)	0	-	24	-	24
<b>TOTAL</b>	<b>105</b>	<b>18</b>	<b>41</b>	<b>155</b>	<b>319</b>
PM (15:00 - 16:00)	A	B	C	D	TOTAL
Corner of Kings Ash Road and Totnes Road W (A)	-	120	-	7	127
Corner of Kings Ash Road and Totnes Road E (B)	17	-	6	-	23
Corner of Totnes Road E and Brixham Road (C)	-	34	-	18	52
Corner of Brixham Road and Totnes Road W (D)	30	-	107	-	137
<b>TOTAL</b>	<b>47</b>	<b>154</b>	<b>113</b>	<b>25</b>	<b>339</b>

**Table 3 - Pedestrian Count Weekday January 2004**

- 2.7.5 This indicates that the main movements in the AM peak are from the corners of Kings Ash Road with Totnes Road W and Totnes Road E onto Brixham Road. This indicates a high proportion of pedestrians crossing Kings Ash Road in a east to west direction, and then crossing Totnes Road W in a north to south direction.
- 2.7.6 In the PM peak the main movements are from the corners of Brixham Road with Totnes Road W and Kings Ash Road with Totnes Road W, indicating that the majority of pedestrians come to the junction via Totnes Road W. This is can be attributed to the Community College.

## 2.8 Land Ownership

- 2.8.1 Figure 4 shows the land owned by Torbay Council in the vicinity of Tweenaway Cross. From this it can be seen that there are some parcels of land owned by Torbay Council which may not be required for a junction improvement and these could be swapped for parcels of land that are required. To use land owned by Torbay Council in any junction improvement or enlargement would pose less of a constraint than to acquire more land from a third party.

## 2.9 Personal Injury Accidents

- 2.9.1 An assessment of the personal injury accident data has been undertaken at the junction over the last three years, which results in the following conclusions:
- 8 Accidents in last 3 years (ending 30/11/03),
  - 75% slight,

- 63% (5) of accidents occur on the approaches to the junction, with the Kings Ash Road approach having the highest proportion,
- All of accidents within junction involve pedestrians (i.e. three in the last three years) and
- 75% of accidents occur within the peak hours.

## **2.10 Environmental Conditions**

- 2.10.1 The junction currently already experiences congestion and this will felt more so once the developments are in place. Congestion has a negative impact on the environment and can increase noise, air, vibration and visual pollution; a reduction in congestion felt at the junction will therefore have a positive environmental effect.
- 2.10.2 With regard to noise pollution, when traffic is travelling at a low speed a slight increase in speed can reduce noise pollution, an increase of speed up to around 30 to 40 Km/h can reduce noise pollution (Chart 4, Calculation of Road Traffic Noise, DoT, 1988). Because of the congestion experienced at Tweenaway Cross, an improvement in capacity, which results in less vehicles queuing, could reduce the level of noise pollution.
- 2.10.3 The 'Air Quality – Review and Assessment, April 2003' has been reviewed with regard to air pollution at Tweenaway Cross, where National Air Quality Standards (NAQ's) were used to compare against measurements and calculations of levels of pollution at the junction. Measurements were taken using a mobile air quality unit, located at the junction and was able to record 10 months worth of data in 2001. The report concludes that all targets will be met (objectives were taken from the 'Air Quality Regulations 2000 and Regulations 2002 for the purpose of Local Air Quality Management') at Tweenaway Cross. The report shows that although targets will be met, currently at the junction the level of Nitrogen Dioxide and Particulates pose a problem in comparison to the stated objectives (see Table 1.0 of Torbay Council's 'Air Quality Updating & Screening Assessment – April 2003). A reduction in congestion at the junction could improve the pollution experienced at Tweenaway Cross.



### 3 PROPOSED DEVELOPMENTS

#### 3.1 Local Plan

- 3.1.1 The RDV (Revised Deposit Version) of the Torbay Local Plan 1995 – 2011 sets out in policy E1 (New employment land on identified sites) allocations for development in the vicinity of Brixham Road, Paignton as follows:

Ref.	Site	Size (Ha)
E1.14	North of Tor Park Road	1.65
E1.15	Tor Park Road Extension	0.3
E1.16	Yalberton Road	16.6
E1.17	Long Road	5.9
E1.18	Kemmings Way	0.4
E1.19	Long Road South	11.44
TOTAL		36.29

Table 4 – Local Plan Developments

- 3.1.2 These sites form the basis of the assessment undertaken in Core Document 23/6 from the Local Plan Inquiry (Transportation Assessment Impact of employment development adjacent to Torbay Ring Road, Paignton).
- 3.1.3 This assessment forecasted the traffic generated by the above developments and distributed it on the adjacent road network. This analysis included a detailed assessment of the likely use of non-car modes, together with the development of a comprehensive travel plan framework to be adopted by the developments. As a result, assessments of traffic growth have been predicted that assume high levels of traffic transferring to non-car modes.
- 3.1.4 Table 5 below identifies the predicted flow at Tweenaway Cross in 2011, assuming all the above developments have been constructed and are fully operational. It should be noted that due to the large amount of development, these flows do not take into account any increase in traffic due to traffic growth as the development traffic has been assumed to consolidate all the background growth in this area. The flows also assume there is a switch of traffic to non-car modes.

AM Peak	A380 Kings Ash Rd	A3022 Totnes Rd (E)	A3022 Brixham Rd	A385 Totnes Rd (W)	Total
A380 Kings Ash Rd	0	70	1010	434	1514
A3022 Totnes Rd (E)	100	0	742	329	1171
A3022 Brixham Rd	807	367	0	37	1211
A385 Totnes Rd (W)	175	201	273	0	649
<b>Total</b>	<b>1082</b>	<b>638</b>	<b>2025</b>	<b>800</b>	<b>4545</b>
PM Peak	A380 Kings Ash Rd	A3022 Totnes Rd (E)	A3022 Brixham Rd	A385 Totnes Rd (W)	Total
A380 Kings Ash Rd	0	106	801	248	1155
A3022 Totnes Rd (E)	165	0	411	226	802
A3022 Brixham Rd	1198	604	0	107	1910
A385 Totnes Rd (W)	255	270	283	0	808
<b>Total</b>	<b>1618</b>	<b>980</b>	<b>1494</b>	<b>581</b>	<b>4674</b>

**Table 5 – Future Traffic Flows at Tweenaway Cross**

- 3.1.5 Comparing the current and the forecasted flows shows traffic is predicted to increase by approximately 30%. The main increase occurs on Brixham Road where flows increase by over 60% in the peak hours.
- 3.1.6 The additional traffic on the network from the developments results in the links of Kings Ash Road and Brixham Road operating over capacity in the peak periods.
- 3.1.7 To accommodate this level of traffic growth on the junction, an improvement to the existing layout of Tweenaway Cross is required.



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#### **4 POTENTIAL IMPROVEMENTS**

##### **4.1 Introduction**

- 4.1.1 The report, 'Transportation Assessment: Impact of employment development adjacent to Torbay Ring Road, Paignton' identified a junction improvement scheme for Tweenaway Cross that meant the junction would operate no worse in the future, with all the development traffic, than it is now. With regards to the urban nature of the junction and conditions on the surrounding network, this was considered at the time to be an acceptable situation.
- 4.1.2 The other option of a major bypass scheme has been discounted on environmental and cost terms.
- 4.1.3 In addition to this, at a recent workshop between Torbay Council, Parsons Brinckerhoff and Devon County Council, several ideas were explored to improve the operation at Tweenaway Cross in terms of junction layout, capacity, pedestrian options etc.
- 4.1.4 The following sections consider these options for junction improvements and pedestrian improvements and outline the benefits of each option.

##### **4.2 Junction Improvements**

- 4.2.1 Table 6 considers the advantages and disadvantages of the improvement options. Indicative layouts of these proposals are given in Appendix 1. All costs are estimates and are subject to change. Work is still to be completed on obtaining the various statutory undertakings information through the junction, which could increase cost and impact upon the deliverability of any scheme.

**TWEENAWAY CROSS JUNCTION  
STUDY**



Scheme	Cost	Advantages	Disadvantages
1. Do Minimum Scheme	-	<ul style="list-style-type: none"> <li>Cheap</li> <li>Involves no land take</li> </ul>	<ul style="list-style-type: none"> <li>High levels of congestion with extensive queues throughout the day (Capacity = 120%)</li> <li>Not good for pedestrians</li> </ul>
2. Local Plan Inquiry Scheme	£1.5m	<ul style="list-style-type: none"> <li>Relatively inexpensive</li> <li>Minimum land take (most of the land needed already in possession of Torbay Council)</li> <li>Will almost accommodate all Local Plan developments up to 2011 (Capacity = 118%)</li> </ul>	<ul style="list-style-type: none"> <li>Does not improve junction for pedestrians, buses and cyclists</li> <li>Does not provide for Traffic Growth after 2011</li> <li>Will have some congestion in peak periods</li> </ul>
3. Large Signalised Junction	£3.1m	<ul style="list-style-type: none"> <li>Will have adequate capacity (operates at 90% capacity in peak hours)</li> </ul>	<ul style="list-style-type: none"> <li>Poor for pedestrians</li> <li>Large land take</li> </ul>
4. Signalised Roundabout	£5.1m	<ul style="list-style-type: none"> <li>Increased vehicular capacity, likely to accommodate developments up to 2011 with spare capacity for future growth (Capacity = 76%)</li> <li>Bus priority could be incorporated</li> <li>Pedestrians could cross at grade, passing through the centre</li> <li>Less property affected than with a large signalised junction</li> </ul>	<ul style="list-style-type: none"> <li>It requires a large amount of land take</li> <li>High costs involving land purchase, moving stats, regarding works etc.</li> <li>Crossing for pedestrians is not a simple procedure means crossing 4 stop lines</li> </ul>
5. Diversion onto side roads (Halcrow Option)	£0.5m	<ul style="list-style-type: none"> <li>Takes some vehicular traffic away from the junction itself, enabling the remaining traffic to negotiate the junction more easily</li> <li>Will be less of a requirement to widen the approaches making them easier for pedestrians to cross</li> <li>Limited land take</li> <li>Inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>Nearby roads unsuitable to take increased traffic loads</li> <li>Potentially unsafe junctions between these roads and the main roads feeding into Tweenaway's</li> <li>Proximity to schools</li> <li>Impact on residential amenity</li> <li>Battersway Road has recently been closed to vehicular traffic with a consequent perceived improvement in amenity and potential safety and it would not be appropriate to reopen it for vehicular traffic</li> </ul>
6. Flyover	£10m	<ul style="list-style-type: none"> <li>Increases vehicular capacity (70%) of junction</li> <li>Road safety advantage through cutting out vehicular conflicts</li> <li>Easier for pedestrians to negotiate junction</li> <li>Bus priority could be incorporated</li> </ul>	<ul style="list-style-type: none"> <li>Significant amenity problems for over 100 properties</li> <li>Disruption problems during construction will still need to keep traffic flowing.</li> <li>Very expensive</li> </ul>
7. Displaced Right Turns (DRT)	£4m	<ul style="list-style-type: none"> <li>Increases vehicular capacity (91%)</li> <li>Large pedestrian refuge in centre of junction</li> <li>Road safety advantage through cutting out vehicular conflicts</li> </ul>	<ul style="list-style-type: none"> <li>Unconventional layout may confuse motorists and cause accidents</li> <li>Larger footprint required, more property affected than for a signalised roundabout</li> <li>Costly – demolish property</li> </ul>

**Table 6 – Potential Junction Improvements**

- 4.2.2 Consideration has also been given to the environmental impact of each of these schemes. The table below shows the environmental impacts of the scheme improvement options in terms of land take and the number of households affected.

Option	Properties Demolished	Gardens Taken	Properties Affected <sup>1</sup>	Sum of Impacts
Do Minimum	-	-	-	0
Local Plan Inquiry Scheme (widening of approaches)	3	4	-	7
Large Signalised Junction	63 +14 Flats	25	-	102
Signalised Roundabout	37	21	-	58
Diverging some movements along side roads	-	-	73 + College	75
Flyover for the north south movement	-	-	94 +14 Flats	108
Displaced Right Turn junction	47 +14 Flats	34	-	95

**Table 7 – Environmental Impact**

*1. Properties affected include visual intrusion caused by a bridge, severance of the community, increased fear and risk when traffic flows along the side roads are increased*

### 4.3 Pedestrian facilities

4.3.1 Consideration has been given to pedestrian facilities at the junction, which results in the options set out in Table 8 below.

Scheme	Advantages	Disadvantages
Displaced pedestrian crossings upstream of the junction	<ul style="list-style-type: none"> <li>A set of pedestrian crossing points, on the main pedestrian desire lines and coupled with robust guard rails at the junction itself, would increase the efficiency of the junction to accommodate a greater volume of vehicular traffic</li> <li>Keeps pedestrians away from the junction increases road safety</li> <li>No need for a pedestrian bridge or subway</li> <li>Inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>Increase in inconvenience for pedestrians</li> <li>There is a risk that some pedestrians may still attempt to cross at the junction, which would be an increased danger risk</li> <li>The crossing points will need to be phased with the existing signals, which could affect the capacity of the junction</li> </ul>
Pedestrian Footbridge	<ul style="list-style-type: none"> <li>Enables grade separation of pedestrians from vehicular traffic</li> <li>Safer, should reduce accidents involving pedestrians</li> <li>Increases junction capacity as no timing for pedestrians is required in the signal timings</li> </ul>	<ul style="list-style-type: none"> <li>Height could cause adverse visual impact</li> <li>Length of ramps – at 1 in 20 gradient, [the minimum for disabled persons] the approach ramps would need to be 130 –140 metres in length</li> <li>Potential loss of amenity and fear of anti-social behaviour</li> <li>Rejected in past Ring Road Inquiry in 1996</li> <li>Costly</li> <li>The junction is at the bottom of a sag curve and a bridge would therefore be highly visible</li> </ul>
Existing walk with traffic pedestrian facilities	<ul style="list-style-type: none"> <li>Can be accommodated with signal timings</li> <li>Does not effect the capacity of the junction</li> <li>Virtually no cost</li> </ul>	<ul style="list-style-type: none"> <li>Involves crossing road in two stages</li> <li>Large distances for pedestrians to cross</li> <li>Possibility of pedestrians ignoring signals and running across the road results in safety issues</li> </ul>

Table 8 – Pedestrian Options

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**5 CONCLUSION**

**5.1 General**

- 5.1.1 This report expands on the issues presented in the Tweenaway Cross Improvement Scheme Committee Report.
- 5.1.2 A number of potential junction improvement options have been discussed presenting their advantages and disadvantages in terms of capacity, cost and environmental effects.
- 5.1.3 Pedestrian options have also been considered and again advantages and disadvantages have been included in terms of cost, environmental effects and the affect on pedestrians.
- 5.1.4 The characteristics of the junction have been assessed, which have shown that the traffic volume is already creating a congestion problem in the peak periods and in the summer months, the demand is set to increase when the Local Plan developments are fully in place this will further increase the pressure on the junction reducing its effective operation. A large proportion of the pedestrian demand can be attributed to the Community College, a review of the accidents at the junction within the last three years have shown that they all involve pedestrians.
- 5.1.5 Both pedestrian and traffic flows are set to increase, both need to be taken into account when choosing the optimal solution at the junction – balancing the different constraining factors.

### Figures

- Figure 1: Location of Tweenaway Cross
  - Figure 2: Detailed Junction Layout
  - Figure 3: Existing layout
  - Figure 4: Torbay Council Land Ownership
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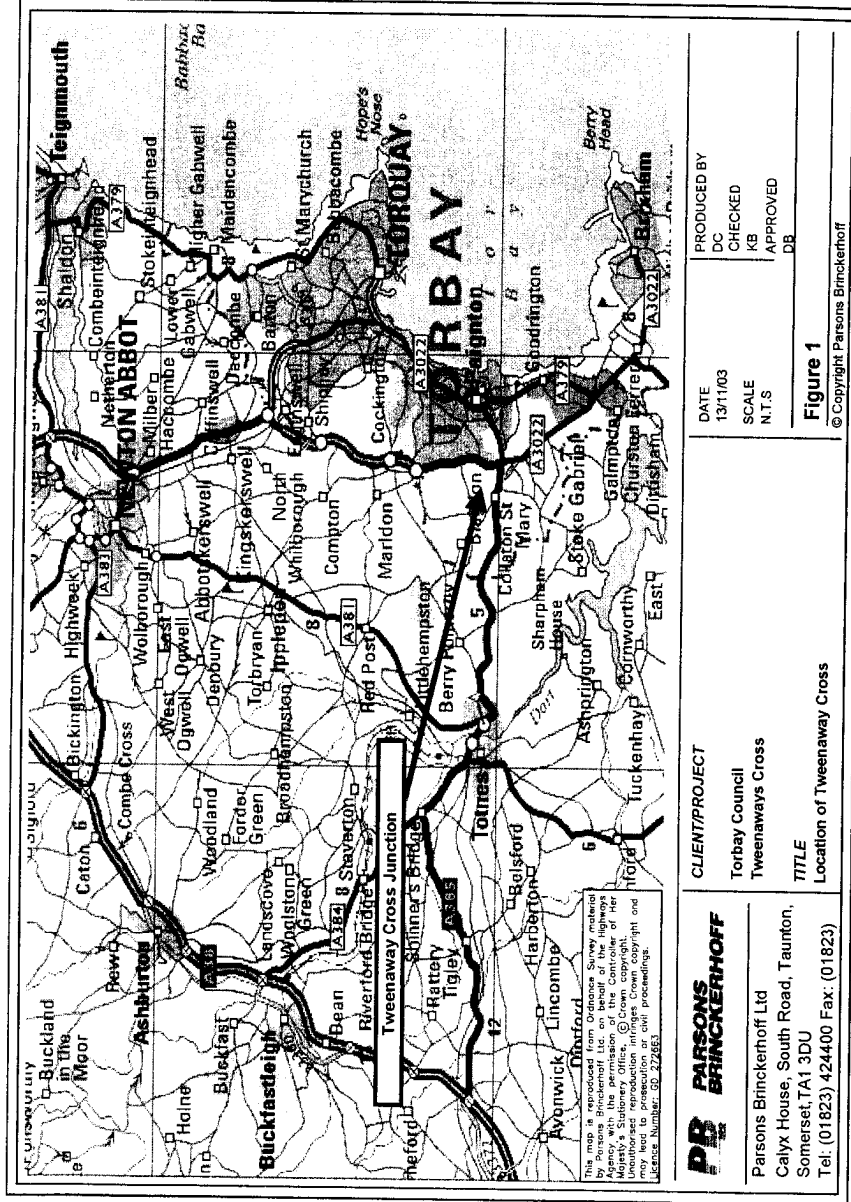
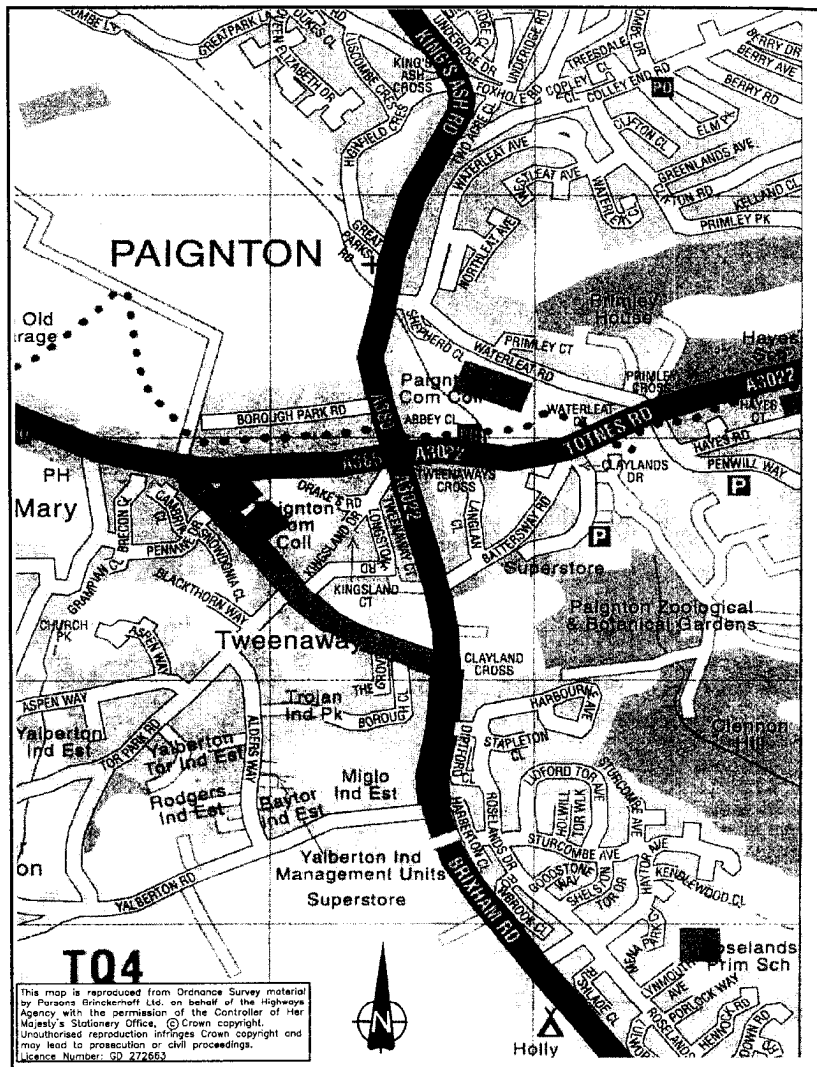


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**Figure 2**

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Appendix 1

Drawing 43519/1/IP1: Existing Layout Indicative Layout  
Drawing 43519/1/IP2: Local Plan Inquiry Scheme Indicative Layout  
Drawing 43519/1/IP3: Large Signalised Junction Indicative Layout  
Drawing 43519/1/IP4: Large Signalised Square-About Indicative Layout  
Drawing 43519/1/IP5: Diversion on to Side Roads Indicative Layout  
Drawing 43519/1/IP6: Flyover Proposal Indicative Layout  
Drawing 43519/1/IP7: Displaced Right Turn Indicative Layout

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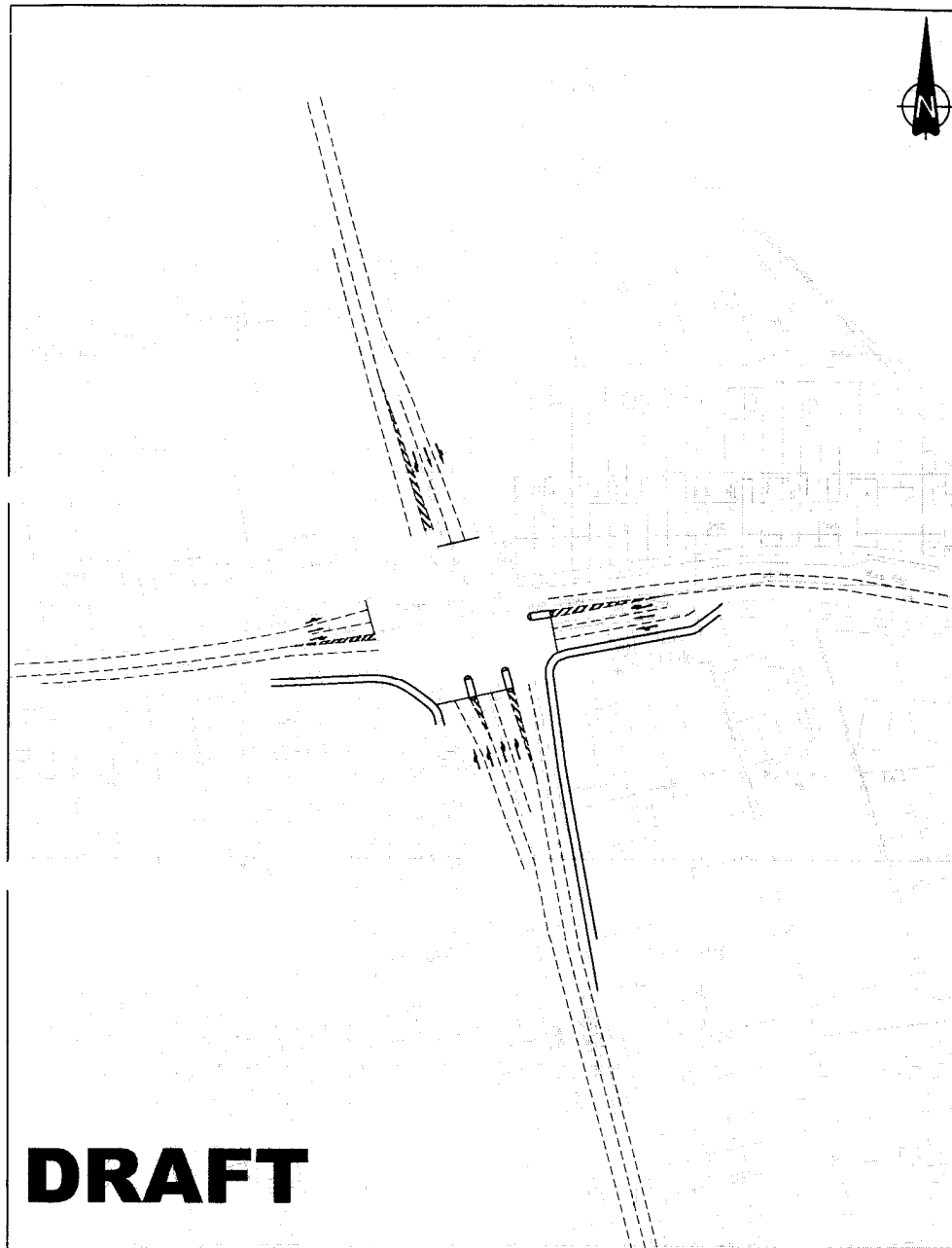
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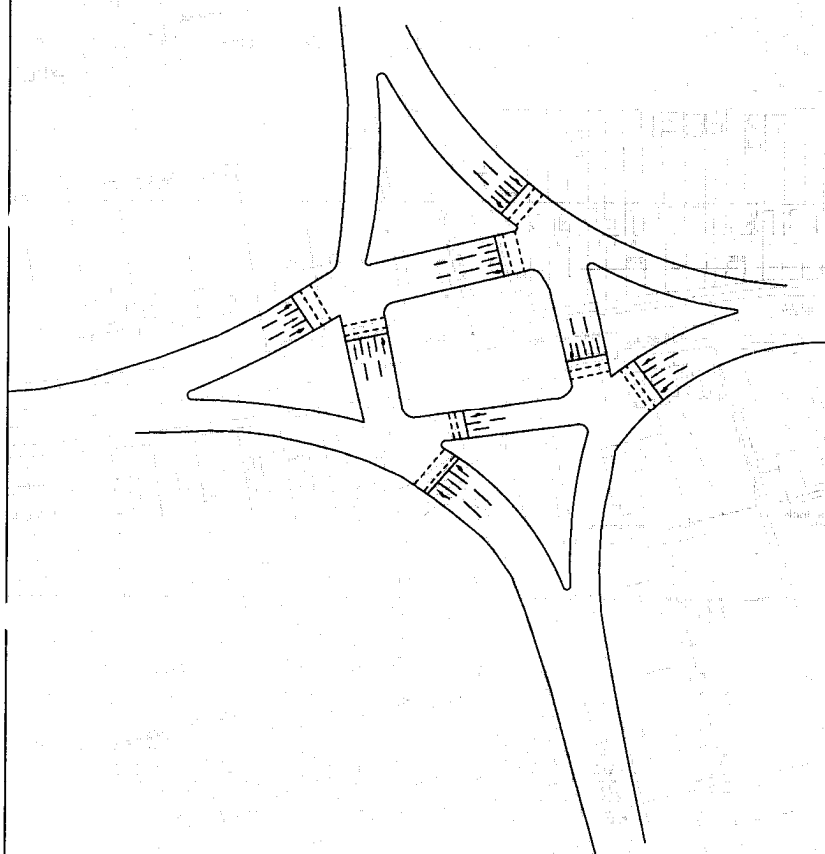
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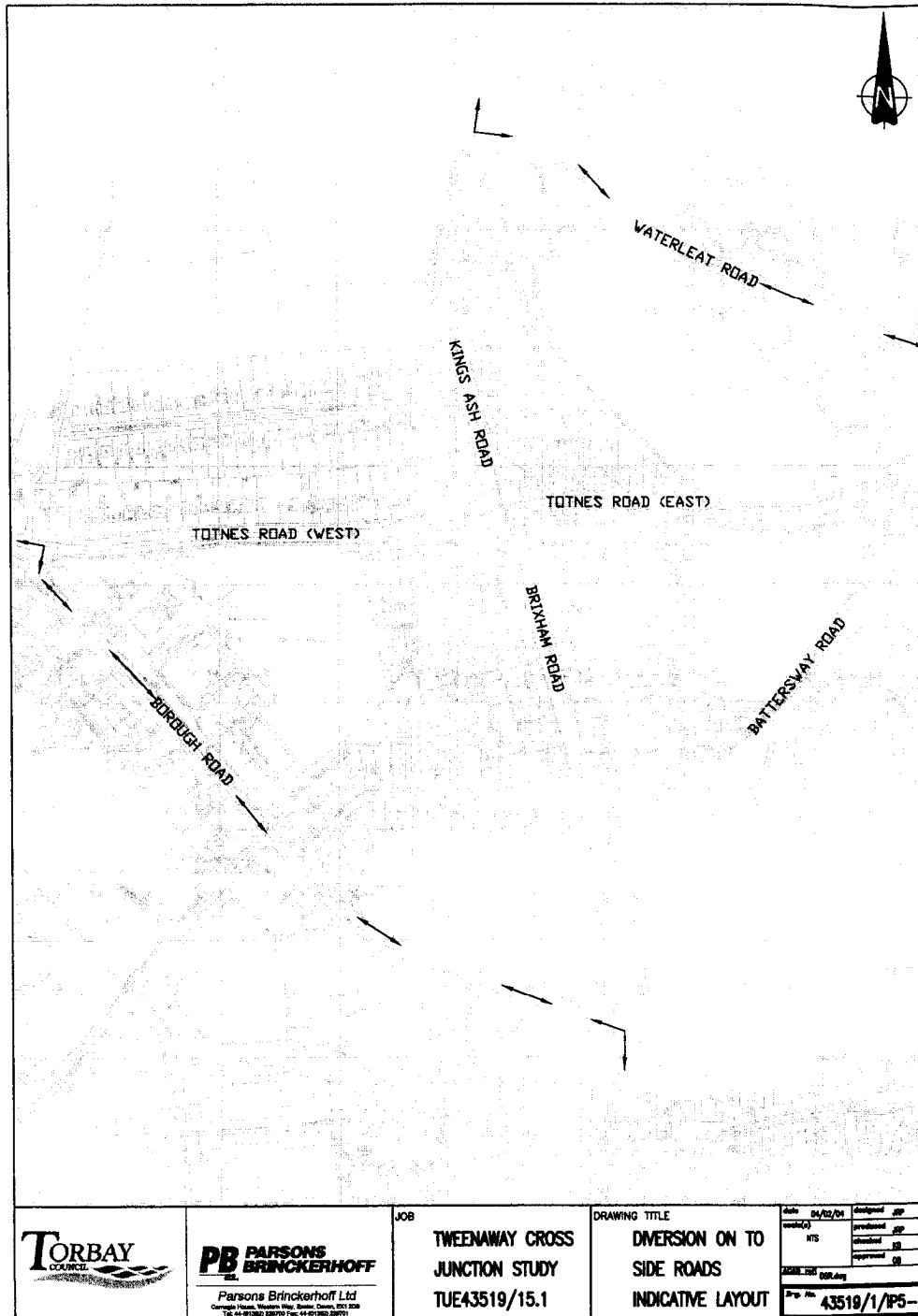
JOB

TWEENAWAY CROSS  
JUNCTION STUDY  
TUE43519/15.1

DRAWING TITLE

LARGE SIGNALISED  
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INDICATIVE LAYOUT

Date	02/02/04	Designed	GA
Drawn	MS	Reviewed	JP
Checked		Approved	DB
Drawn	LSB:dlg		
Draw No.	43519/1/IP4-		



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JOB

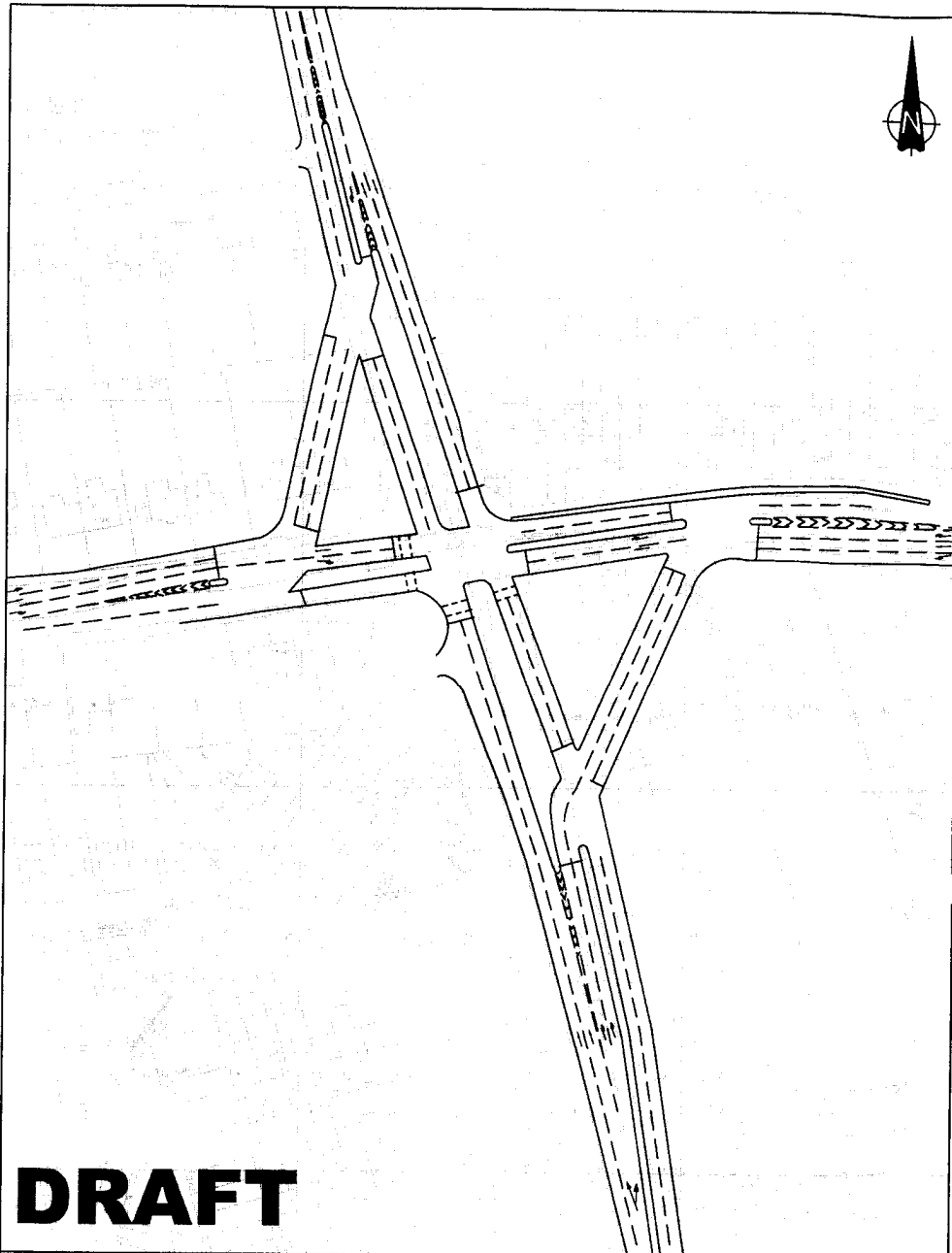
TWEENAWAY CROSS  
JUNCTION STUDY  
TUE43519/15.1

DRAWING TITLE



DIVERSION ON TO  
SIDE ROADS  
INDICATIVE LAYOUT

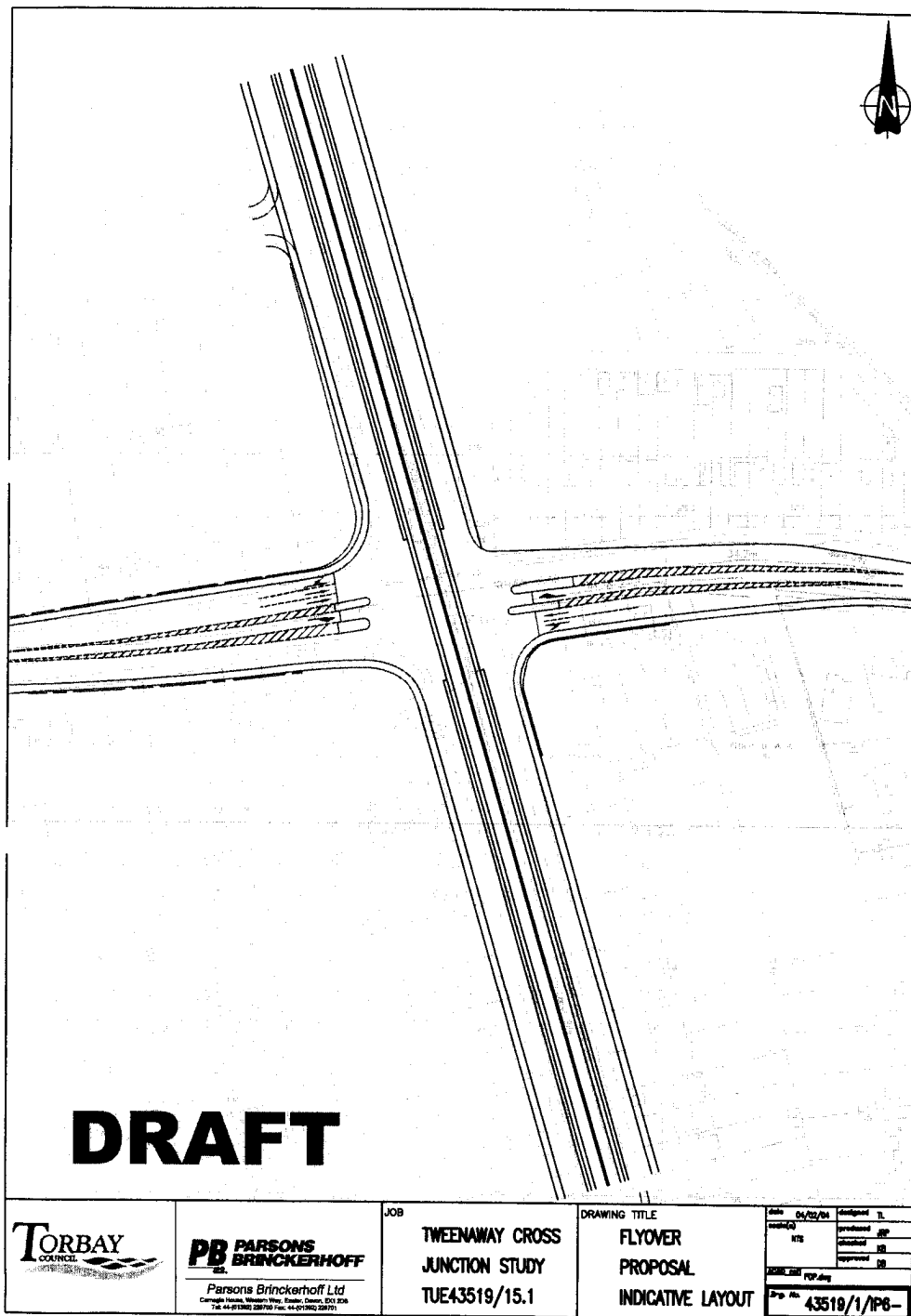
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checked	HTS	produced	JPP
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		approved	SB
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**DRAFT**

 <p><b>TORBAY</b> COUNCIL</p>	 <p><b>PARSONS BRINCKERHOFF</b> LLP</p> <p>Parsons Brinckerhoff Ltd Croydon House, Western Way, Croydon, Surrey, S91 3JH Tel: 01889 470000 Fax: 01889 470001</p>	JOB  <b>TWEENAWAY CROSS JUNCTION STUDY TUE43519/15.1</b>	DRAWING TITLE  <b>DISPLACED RIGHT TURN JUNCTION INDICATIVE LAYOUT</b>	<table><tr><td>Date</td><td>05/02/04</td><td>Designed</td><td>DA</td></tr><tr><td>Drawn</td><td>KTS</td><td>Produced</td><td>JP</td></tr><tr><td></td><td></td><td>Reviewed</td><td>SB</td></tr><tr><td></td><td></td><td>Approved</td><td>CB</td></tr><tr><td>File No.</td><td colspan="3">43519/1/1P7-</td></tr></table>	Date	05/02/04	Designed	DA	Drawn	KTS	Produced	JP			Reviewed	SB			Approved	CB	File No.	43519/1/1P7-		
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Drawn	KTS	Produced	JP																					
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File No.	43519/1/1P7-																							



 <p><b>TORBAY</b> COUNCIL</p>	 <p><b>PB PARSONS BRINCKERHOFF</b> LLP</p> <p>Parsons Brinckerhoff Ltd Cambridge House, Westgate Way, Exeter, Devon, EX2 5BN Tel: 44 (0)1392 288700 Fax: 44 (0)1392 288701</p>	JOB	TWEENAWAY CROSS JUNCTION STUDY TUE43519/15.1	DRAWING TITLE	FLYOVER PROPOSAL INDICATIVE LAYOUT	<table><tr><td>date</td><td>04/02/04</td><td>designed</td><td>TL</td></tr><tr><td>checked</td><td>NTS</td><td>produced</td><td>JP</td></tr><tr><td></td><td></td><td>checked</td><td>JS</td></tr><tr><td></td><td></td><td>approved</td><td>DS</td></tr><tr><td colspan="4">DWG. No. POP.dwg</td></tr><tr><td colspan="4">Proj. No. 43519/1/IP6-</td></tr></table>	date	04/02/04	designed	TL	checked	NTS	produced	JP			checked	JS			approved	DS	DWG. No. POP.dwg				Proj. No. 43519/1/IP6-			
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