Summary of East Herts Modelling Work undertaken to date to support East Herts Local Plan Work

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Introduction

1. East Herts District Council are looking at a number of potential housing development options as part of their local plan to 2031.

2. The potential transport impacts (particularly on the highway network) are a key consideration in the formulation of a preferred development strategy. In order to assist this process, evidence from transport modelling work has been collated and assessed. This work is from a number of different sources:

    - Diamond spreadsheet modelling work – used for sifting between broad initial development options

    - A test of the implications of developing 10,000 dwellings north of Harlow in conjunction with a new junction 7a on the M11 undertaken by Essex County Council using the Harlow Stansted Gateway Transport model.

    - Detailed Paramics modelling work undertaken by developers of the Bishop's Stortford North (ASR) site to support their planning application.

3. This note has been prepared by Hertfordshire County Council Highways. It pulls together the key technical findings from the work to date and suggests an ongoing programme of technical work to be undertaken.

Initial option sifting - Diamond

4. East Herts District Council in conjunction with Hertfordshire County Council commissioned an initial assessment of the impact of various development options in East Herts using the Diamond model.

5. Diamond is an Excel spreadsheet based tool owned and operated by AECOM consultants. It can be used to help sift broad development options and provide guidance on likely highway impacts. It provides the following information:

    - An estimate of the likely traffic volume and traffic routeing from new developments.

    - An indication of the relative changes in traffic flow and stress (volume to capacity ratios) on links across the network.

    - An indication of the highway links which are likely to become problematic (in highway terms) with a particular development option.

    - Comparative network wide statistics (e.g. average vehicle speeds and delays) enabling a broad assessment of the merits of different options.

6. The calculations also allow for development growth outside the district and an assessment of the cumulative impacts of different developments over the wider area.

7. As it is based on a spreadsheet and is not a specialist traffic model it is unable to provide the following:

    - An allowance for existing traffic re routeing due to congestion caused by new development.

    - Information on the impacts of introducing new highway infrastructure (e.g. a new link road, bypass or junction improvement). The results can therefore be seen as a 'worst case' i.e. the situation assuming no improvement to the highway network.

    - Information on additional delay / congestion at junctions (although the estimated changes in traffic flow can be compared against critical junctions).

8. A traditional highways model (e.g. a Saturn based model such as the Harlow Stansted Gateway Model (HSGTM) is required to answer the points above. However the cost and time of running option tests and its limited coverage in East Herts mean that it was not practical to use this to test the multiple development options at this stage. Normally a run of the highways model would be undertaken once one or two preferred options have been identified.

Diamond modelling Do minimum reference case

9. A reference case has been developed based on 3,758 new dwellings including committed sites (those with permissions) and SHLAA sites plus an allowance for development in the villages. A second reference case also includes 2,500 new dwellings north of Bishop's Stortford.

10. The Diamond modelling results indicate that compared with the Base year (2009), by 2031 a number of links on the network are predicted to become stressed with development from committed sites and SHLAA sites plus general background growth and allowance for development outside East Herts (which is taken from the East of England Model EERM and based on growth levels indicated in scenario 1 of the Regional Spatial Strategy). Maximum use of a single runway at Stansted (35 million passengers per annum) is also assumed.

11. In the absence of any additional infrastructure, links which are predicted to become highly stressed (ie have traffic volumes over 95% of capacity are as follows:

    - A120 around the north of Bishop's Stortford (largely due to increases in through trips)

- A1170 and B1004 (Ware to A10) – due to growth around the Hertford and Ware areas accessing the A10
- Various links in Harlow (Fifth Avenue, Southern Way, Epping Road)
- A1250 Dunmow Road in Bishop's Stortford & Parsonage Lane.
- A602 Ware Road /Westmill Road

These are in addition to the already identified congestion hotspots at junctions (e.g. Hockerill Junction and roundabouts on A414 in Hertford).

12. Adding in the additional development north of Bishop's Stortford (2500 dwellings on the ASR sites assuming access via Rye Street and Hadham Road) is predicted to cause additional stress on the network, particularly on the B1383 Stansted Road (which the model forecasts will exceed capacity in 2031), the B1004 Rye Street and the A1250 Hadham Road. There are also increased flows on the A120 eastern approach to the M11 and the A1184 through Sawbridgeworth.

13. There are therefore a number of problem locations in highway terms even before considering additional larger scale development options.

Scenario 1 tests

14. The Diamond Model has then been used to test 7 different development options within East Herts.

15. The first group of options (Scenario 1) are based on a total of 14,258 new dwellings. All scenarios include the 3,758 new dwellings from the Reference case plus the 2,500 dwellings north of Bishop's Stortford. A number of key development options have also been tested as follows:

    1a – assumes 10,000 dwellings North of Harlow (8,000 built by 2031)
    1b – assumes 5,000 dwellings North of Harlow plus 3,000 around Ware
    1c – assumes no development North of Harlow and instead 8,000 dwellings spread around Sawbridgeworth, Ware and East of Welwyn Garden City

16. Overall network statistics indicate that housing development concentrated north of Harlow (scenario 1A) has the least impact on the highway network overall even without new infrastructure (highest average network speed, lowest additional delay – measured by additional Passenger Car Unit (PCU) km and PCU hours)). With this option a high proportion of development trips are assumed to go to local destinations in Harlow, reducing the impact on the wider highway network.

17. However, compared with the reference cases large changes in traffic flow are predicted to occur within Harlow and on High Wych Road and the A1184 in the Sawbridgeworth area, leading to capacity issues.

18. Other key predicted increases in traffic flow are on the on the A414 between Harlow and the A10 and also increases on the A10 itself, particularly on the section between Turnford and Hoddesdon and on the A1170 south of Hoddesdon.

19. Reducing the size of development north of Harlow and adding development around Ware instead, not surprisingly reduces the amount of additional traffic within Harlow whilst increasing traffic in the Ware area particularly on the A1170 south of Ware, Baldock Street / High Street and the A119 Ware Road in Hertford.

20. In terms of strategic links additional flows are predicted along the length of the A10, on the A120 and on the A414 Gascoyne Way and on the A602 (Westmill Road and Broadhall Way). Whilst link capacity is not an issue, there are likely to be problems with junction operation both within central Ware, the A414 in Hertford and on the southern section of the A10.

21. Spreading the development around Sawbridgeworth, Ware and Welwyn Garden City instead of North of Harlow (Scenario 1c) generally reduces the levels of additional traffic within Harlow but increases traffic at a number of locations around the rest of East Herts including locations already under pressure including:

    - A414 Gascoyne Way – This option has the greatest impact with a large number of additional vehicles in AM peak which will add considerable pressure to the Pegs Lane and Bluecoats roundabouts.

    - A1184 Cambridge Road / London Road / Harlow Road – Sawbridgeworth – This option has the greatest impact with a large number of additional vehicles (compared with reference case) adding considerable pressure to an existing congestion hotspot (centre of Sawbridgeworth). West Road and High Wych Road are also predicted to reach capacity.

    - A119 Hertford Road / Ware Road – Additional 250 vehicles added to a stretch of road already experiencing congestion due to junction operation.

    - A1170 north of Ware

    - A10 Ermine Street to Baldock Road

    - B195 Birchall Lane – large number of additional vehicles compared to reference case. Increases in traffic are also predicted on Blackfan Road and Cole Green Lane.

22. Although Diamond doesn't explicitly model junction impacts the greater number of links affected by increased flows with this option results in considerably poorer overall network performance both within the East

Herts area and across the whole model area (lower speeds, greater delay) when compared with scenarios 1a and 1b.

Scenario 2 tests

23. The second set of scenarios is based on a smaller level of development (around 12,300 new dwellings) spread around East Herts district with no development north of Harlow as follows:

    2a - New dwellings spread around south Bishop's Stortford, Sawbridgeworth (west), Ware (1,700) and Buntingford

    2b –Development east of Welwyn Garden City, larger development at Sawbridgeworth West, plus smaller developments at Bishop's Stortford east, Buntingford and Terlings Park.

    2c – Development concentrated east of Welwyn Garden City, Buntingford and around Ware with smaller development south of Bishops Stortford.

    2d – Development concentrated at Sawbridgeworth (west) and east of Welwyn Garden City.

24. Scenario 2a performs badly in terms of overall network performance, with larger increases in flow in the Bishops Stortford area (London Road and Whittington Way), on the A10 north of Ware and on the A507 and A602 routes compared with the other scenarios. There are also large increases in flow in the Sawbridgeworth area.

25. Scenario 2b has the greatest impact on Sawbridgeworth of any scenario with the A1184 Harlow Road and West Road both becoming highly stressed. This indicates that a development of this scale (3,000 dwellings) could not be accommodated without additional infrastructure to relieve the A1184. Impacts on the A414 and A10 are however less than with other scenarios.

26. With Scenario 2c the flow increases associated with the development to the south of the town are predicted to lead to increases in flow of between 250 – 500 vehicles on Rye Street, London Road and Whittington Way leading to issues with capacity on these links. In Buntingford flows on the B1038 Baldock Road are expected to increase significantly causing capacity issues. In Hertford increases of up to 250 vehicles are anticipated on the A414 Gascoyne Way and Thieves Lane which would exacerbate existing junction capacity problems.

27. This scenario does however have the least impact of the options in the Sawbridgeworth area, although flows on the A1184 Cambridge Road are still expected to increase with a worsening of capacity. In Ware flow increases are predicted on the A119 , the A1170 and on Baldock Street / High Street which would cause issues with junction operation. There are

also flow changes on Blackfan Road, Birchall Lane and Cole Green Lane in Welwyn Garden City leading to capacity issues which would require mitigation.

28. Scenario 2d has the highest flow increases in Welwyn Garden City with Birchall Lane becoming highly stressed in capacity terms and large increases in flow on Blackfan Road, Cole Green Lane and the B1000 Hertford Road. There are also large increases in flow on the A414 towards junction 4 of the A1(M) and this is the only option to result in discernible increases in flow on the A1 (M) itself between junctions 3 -4 are also an issue. Flow increases and capacity are also an issue in Sawbridgeworth. Due to the concentration of the development at the edge of the district in Welwyn Garden City this option performs well in terms of impact on the East Herts Highways network.

Implications of Diamond Modelling Work

29. The Diamond Modelling work has been used to give an indication of the likely areas of highway link related capacity problems resulting from an initial set of development options. In terms of performance of the highway network in East Herts the option with the least overall highway impact is to concentrate development to the north of Harlow. However there are considerable impacts within the Harlow area and the results indicate that major highway works would be required including a new crossing of the River Stort and a potential northern distributor road to relieve pressure around the northern Harlow and High Wych areas along with either a link to the M11 or a local bypass around Sawbridgeworth. Further work however, needs to be undertaken to confirm these requirements.

30. Without major development north of Harlow alternative large development sites result in the highway impact being spread around the district and therefore poorer overall network performance. The Diamond work indicates particular issues with large scale developments west of Sawbridgeworth (need for a new bypass or major new infrastructure). All development options are also likely to necessitate the need for major improvements at the A414 junctions within Hertford.

31. The options tested a range from an additional 12,000 – 14,500 dwellings. No additional test has been undertaken for higher numbers of dwellings (16,000) as much of the additional provision is due to the allowance for windfall sites (locations of which are unknown so can't be explicitly tested). There are also more SHLAA sites and those with permissions compared to what has been previously tested. As these are made up of relatively small sites the impact of these can’t easily be determined through DIAMOND.

32. It is understood that the final strategy is unlikely to exactly match any of the test scenarios, as the strategy selection process is one of evolution through iterative refinement. However, unless entirely new development

locations emerge, the larger potential development locations have all been tested as far as is useful using DIAMOND. It is therefore not considered helpful to undertake further tests of different combinations of options at different levels of growth within the 10,000-17,000 dwellings range.

33. Irrespective of the different combinations of options or levels of growth within the range up to 17,000 dwellings, DIAMOND appears to show that the main conclusions are as follows:

- Development east of Bishops Stortford can be accommodated without any significant highways infrastructure
- Larger scale development south of Bishops Stortford is likely to require improvements to Whittington Way, London Road and key junctions along these routes
- 500 dwellings should be capable of being accommodated at Buntingford
- Large-scale development at Sawbridgeworth would probably require major new infrastructure (such as a new bypass)
- There will be a need to upgrade junctions on the A414 through Hertford whichever development scenario is chosen.
- For development east of Ware, although link capacity is not an issue, there are likely to be problems with junction operation on the Baldock Street / High Street corridor.
- development of around 2,000 dwellings within East Herts, to the east of Welwyn Garden causes some problems on local links and junction capacity on the A414 may be an issue.

34. Further work will need to be undertaken out to identify infrastructure requirements in those areas where there is likely to be an impact on the highway network, and to assess the ability to deliver necessary improvements and to inform infrastructure planning for the district. Therefore at this stage there is no clear evidence to rule out the higher level of development on highways grounds.

Assessment using the Harlow Stansted Gateway Model

35. The initial Diamond assessment work has indicated that concentrating development to the north of Harlow without providing new infrastructure is predicted to have a large impact in the local Harlow area but relatively little effect elsewhere in the wider East Herts area compared with the other scenarios.

36. The Harlow Stansted Gateway Model (HSGTM) is a sub regional Saturn model covering the Harlow, Bishop's Stortford and Sawbridgeworth areas which can be used to give a more detailed indication of the impacts of new development in this part of the district. It does not however cover the Ware, Herford, Buntingford or Welwyn Garden City areas. Unlike a spreadsheet based approach it is able to take into account the impact of new infrastructure, congestion effects at junctions

and also behavioural changes such as the re routeing of existing traffic to avoid congestion.

37. Essex County Council has undertaken some initial modelling work using the HSGTM which indicates that junction 7 of the M11 is a key constraint even with existing permitted development.

38. Further interim work has been undertaken by Essex to test the impact of a new junction (7a) plus the associated link to Gilden Way (the Harlow Eastern Access Route Phase 1) along with local mitigation measures within Harlow.

39. The test was undertaken in the 2036 model year assuming indicative) levels of development in Harlow, East Herts, Uttlesford and Epping. A further sub test was undertaken with 10,000 dwellings and 2,500 jobs in North Harlow (and is therefore broadly equivalent to Scenario 1B of the Diamond tests). The HSGTM test assumed that a second crossing of the River Stort would be provided to the west of Harlow (linking to Elizabeth Way) along with dualling of the A414 between the Eastwick and Burnt Mill roundabouts. The test also assumed that the A120 Little Hadham Bypass would be built along with junction improvements on the A120 north of Bishop's Stortford.

40. The interim results indicate that over 50% of trips from large-scale development north of Harlow are forecast to travel to destinations within Harlow. Despite this large number of local trips, significant increases in daily traffic levels are forecast on the A414, A10, High Wych Road and the A1184 at Sawbridgeworth. These results back up the Diamond modelling work.

41. This initial testing work indicated that additional traffic leads to network stress at a number of locations. In the AM peak the A10 northbound approach to Rush Green is predicted to be at capacity along with the A414 approach from Hertford. A number of links also reach capacity within Sawbridgeworth including the A1184. There are also capacity issue on the A120 north of Bishop's Stortford in the eastbound direction and on the M11 southbound. It should however be noted that further refinement of the development scenarios and option testing is required to confirm these locations.

42. In the PM peak the model indicates that the key increases in network stress are on the A414 itself at Eastwick, High Wych Road and on the A10 northbound to the north of Hoddesdon and on the A10 and A414 approaches to Rush Green.

43. The technical report associated with the test acknowledges that not all development trips are released onto the network due to congestion levels in the model. This indicates the potential need for a Harlow northern bypass to provide access to large-scale development north of Harlow but this has not yet been tested. It should be noted that the

results to date have not been fully verified at this stage, and will be finalised and formally reported as part of the whole package of modelling work using the HSGTM.

Modelling work associated with the Bishops Stortford ASR planning application

44. A planning application has been submitted in relation to development of the ASR sites to the North of Bishop's Stortford (totalling 2500 homes). This has included a technical assessment of the impact of the additional vehicle trips on the highways network in the local area using a detailed traffic microsimulation model (Paramics). The transport work submitted in support of the planning application is available on the application website at www.bishopsstortfordnorth.com.

45. The Paramics results indicate that a development of this scale could be accommodated providing a number of key mitigation measures were in place including the following:

- Geometric improvements at the A1250 / A120 junction
- Geometric improvements at the A120 / B1383 junction
- Measures to reduce vehicle trip rates from the new development (provision of new bus service, travel plan pack for new residents and provision of local facilities – local neighbourhood centres and schools).
- Funding of a Travelsmart programme for the Bishop's Stortford urban area to encourage travel by non car modes.

46. The Transport Assessment does not indicate any requirement for dualling of the A120 north of Bishop's Stortford.

47. It is assumed that the development would be accessed via new junctions with the A1250 Hadham Road and Rye Street. It has also been tested with / without a new direct access onto the A120. Results indicate improved network performance if the new junction was provided.

48. The modelling work indicates that development traffic could be accommodated at M11 junction 8 without additional mitigation. It is predicted that relatively few vehicles would travel from the development towards Little Hadham. Although there would be some increases in queues and delays and the application suggests that this could be mitigated by redesign of the Little Hadham signals rather than requiring a new bypass.

49. HCC are currently reviewing the suggested traffic impacts and resulting mitigation measures. If found to be acceptable these would be funded through developer contributions.

Summary of work undertaken to date

50. The key findings of the various strands of modelling work undertaken to date indicate the following:

- Initial option sifting using Diamond modelling has indicated the potential capacity issues with different development locations and has identified areas which are likely to require major investment in new highway infrastructure if development went ahead.

- The initial Essex County Council tests using the Harlow Stansted model indicate that a second Stort crossing, dualling of the A414 between the Eastwick and Burnt Mill roundabouts is required as a minimum to enable large scale development north of Harlow. The outputs showing flow increases and capacity effects also indicate the potential need for major new highways infrastructure in the north Harlow and Sawbridgeworth areas. Capacity problems are also indicated on the A10 in the Rush Green and Hoddesdon areas.

Requirements of Infrastructure Planning

51. As Local Highway Authority, the County Council consider that the following information is required as part of the Infrastructure Planning process and would be necessary for the Local Highway Authority to support the District during the examination of the Local Plan:

- Identification of the impacts of growth on the highway network. The level of detail required will depend on the level of information contained within the Local Plan. Generally there would be a need for sufficient detail to identify key congestion areas and enable identification of appropriate mitigation solutions [1]

- Identification (and testing) of potential mitigation measures likely to be required to accommodate the development (Diamond and IURS work has given some initial indications of the locations and type of scheme which could be considered)

[1] The modelling work completed to date (DIAMOND) has identified locations where proposed growth is likely to impact on the Highway network (in terms of flow increases and stress levels). The NPPF requires development only to be restricted where the resultant impact on the Highway Network is 'severe'. As yet there is no agreed definition of 'severe' therefore the assessment so far has concentrated on those links which are highly congested with a volume to capacity ratio of over 95%.

Once the preferred development option has been identified then further modelling at an area level or the use of an appropriate existing model covering the affected areas of the network will be required to take into account potential capacity constraints on junctions and to identify (and potentially test) appropriate mitigation options. This will enable LPAs to demonstrate that capacity constraints can be overcome and that proposed levels of growth would not have an unacceptable impact on the Highway Network. This is similar to the work currently being undertaken as part of the HSGM looking at potential impacts should development come forward to the North of Harlow.

- Identification of indicative costs & timescale for implementation of mitigation measures and where necessary, undertake a high level feasibility review to identify any 'showstopper's (e.g. major environmental / land issues) which could impact upon delivery.

- Identification of how highway improvements are to be funded and delivered.

52. Any tests will also need to take into account of the most likely development scenarios in neighbouring authorities (e.g. HCC and East Herts are working with Essex local authorities to establish cumulative impact growth proposals in the Harlow/Stansted Gateway area)

53. It is considered that the above approach would be consistent with NPPF requirements for Local Plans to assess the quality and capacity of infrastructure and consider the scope for additional capacity or improvements to meet the needs of combined development aspirations. This approach will also ensure that there is a reasonable prospect that planned infrastructure is deliverable and is also consistent with that taken by the Highways Agency in relation to the Strategic Road Network.

Next Steps

54 Once the preferred option for growth in the District is agreed, further technical work on the impact of development on the local highway network will need to be undertaken (focused on those areas identified at or above capacity in the DIAMOND modelling). The results of this work will then confirm the locations where there are capacity issues (both links and junctions) and enable the identification (and testing) of potential mitigation measures. It should be possible to define broad scheme cost estimates at this stage.

An example of such a strategy (for example should development be brought forward to the north of Harlow) is as follows:

- Refined option test of the HSGM with 10,000 dwellings north of Harlow to see if this can be accommodated without a Harlow Northern bypass[2].

- Pending outcome of above test consider the impacts of a new road linking North Harlow with M11 junction 7a to determine whether development north of Harlow is dependent on a new link

[2] Depending on the preferred strategy EHDC wish to pursue an option test could also be undertaken of the implications of 5,000 dwellings north of Harlow. HCCs preferred strategy however is for the test to be undertaken with the higher level of development to give an indication of the potential longer term growth to the north of Harlow and to ensure that the need for new infrastructure is fully assessed.

- Carry out high level review of existing feasibility work on options for a link road to come up with cost estimates and identify any potential showstoppers to delivery.

- Once a preferred option has been determined, feasibility work to assess the likely cost / implications of other likely mitigation measures (backed up with a 'do something' run of the HSGTM).

- Identify how the cost of the scheme is to be funded and delivered. .

55. The ease of obtaining the information outlined above will depend on which development locations are included in the preferred strategy. For example, the Harlow Stansted Gateway Model (HSGTM) covers the eastern part of the district and should be used to provide information on the implications of development in this area but in other parts of the district there is no established model should strategic growth locations come forward in those areas (e.g. Welwyn Garden City/ /Buntingford). Therefore, should EHDCs preferred strategy concentrate development in areas outside the HSGTM area there may be a gap in model coverage and it will be potentially more difficult to get together the transport evidence.

56. An obvious problem location is the A414 corridor through Hertford where there are already issues with junction capacity and where the Diamond modelling indicates significant increases in flow regardless of the development scenario tested. Some modelling and the identification of potential schemes have already been identified through the Inter Urban Route Study and the Hertfordshire Investment and Infrastructure Strategy (HIIS) work - this can be used as a starting point for the evidence. Although the corridor is not part of the HGSTM area there are two local Paramics models that could potentially be used to test mitigation options.

57. HCC will continue to work with EHDC to try to fill the evidence gap once the preferred strategy is defined.