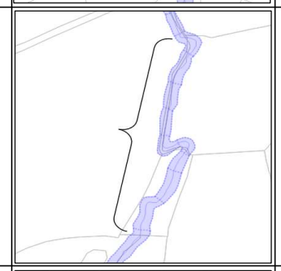
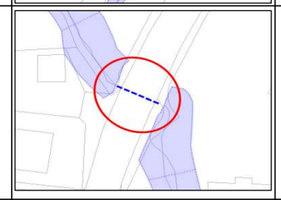
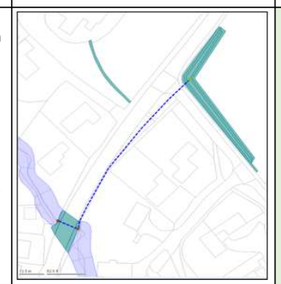
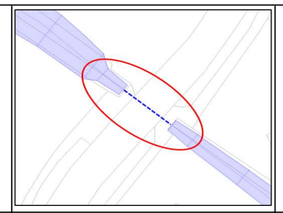
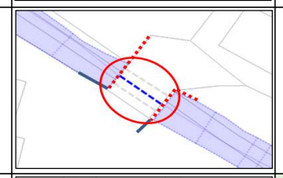
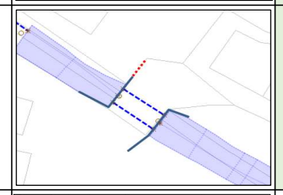
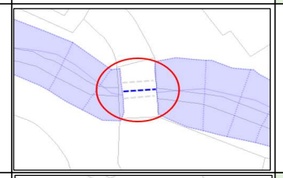
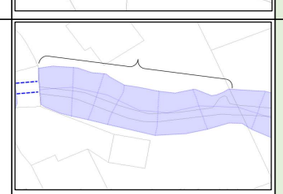
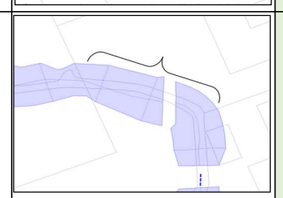
Loxwood Flood Alleviation Scheme

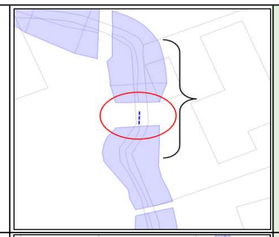
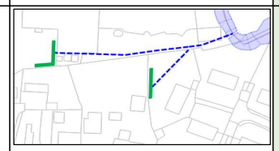
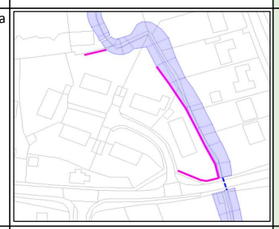
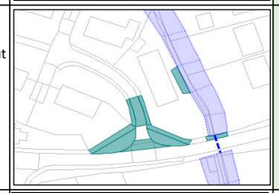
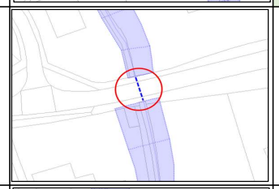
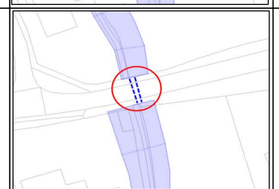
Works Options Review and Scheme Selection

Ref: 15043-R001-A FOR COMMENT

Date: 21/01/2020

Option Ref	Option Source	Description	Location	Works	Physical Impact	Flood Risk Impact	Scheme Risks (Flooding)	Screenshot	Development Potential: Min Scheme	Development Potential: Max Scheme	Development Potential: Exclude	Additional Comments
A	Agreed modification to EA Long List Option 4	Upstream flood storage area	Adjacent to North Hall	New 1.3m high flood embankment crossing stream. High flow restriction culvert (1.2m dia. circular). Offline low bund (0.3m to 0.5m high) along right bank. Excavation of large 1.5ha field area to 0.3m to 3.0m depth. Flapped drainage outfalls from lowered field FAS to stream.	Stream channel and adjacent landowners	Reduction in downstream peak flood water levels	Increased flood risk to village in the event of breach failure				✓	The scheme is not considered practical and therefore excluded due to the significant works required to deliver the scheme and the limited potential window of flooding that it could provide flood risk benefit. Additionally, there would be significant increased risk to the village with the creation of a large body of retained water upstream, due to breach failure.
B	EA Long List Option 5	Natural flood risk management measures for upstream stream channel	Stream channel upstream of North Hall	Increase channel roughness and flow conveyance using in channel debris (160m to 170m reach length)	Stream channel	Negligible reduction in downstream flood water levels, however increase flood water levels where roughness increased.	No adjacent properties affected by local increases in flood water levels.				✓	If additional debris included in channel, then these should be properly anchored to reduce the risk that material could be mobilised during a significant event and block downstream culverts.
C	EA Long List Option 3	Guildford Road culvert upsizing	Culvert at Guildford Road crossing of stream	Replace 1.3m dia. circular culvert with 2.4m wide by 1.2m high box culvert. New upstream headwall and wingwalls likely required. No change required to upstream and downstream channels.	Guildford Road (during construction)	Flood water levels reduced local upstream and downstream of Guildford Road, with the greater reduction upstream. No reduction and/or increase in flood water levels downstream.	The modelling has suggested that there should not be an increased fluvial flood risk to downstream properties, assuming that the stream channel is properly maintained.			✓		It is recommended that a trash screen not be included, due to the potential higher risk of blockage of the screen by small plant matter not at risk of blocking the new enlarged culvert. If considered at risk of large material blockage, then upstream interception should rather be considered. The impact on existing services along Guildford Road are unknown, therefore the upsized culvert has been assumed with a soffit level no higher than existing.
D	EA Long List Option 9	Spy Lane surface water overland flow interception bund	Western corner of field bounded by Spy Lane and Guildford Road (also referred to as field south of Merryhills Lane)	95m long bund, with max height of 0.5m and 1m wide bund crest. 0.5m max depth ditch along inside of new bund, with 1m bed width. Drain at bed of ditch to stream via either new pipe or connection into existing road drainage along road (assuming road drainage connection to stream).	Farmers field boundary, Spy Lane and potentially Guildford Road (or footpath along road).	Reduction in surface water flow over Spy Lane and surface water flow (flooding) through properties between Spy Lane and the stream. No reduction in fluvial flood water levels.	The scheme would result in a body of retained water with a crest level approximately 1m above the level of Spy Lane. Therefore there would an increased flood risk to the properties in the event of a failure of the bund. There is an additional risk of blockage of the drainage pipe or road drainage.		✓	✓		The bund will need to be engineered to reduce the risk of breach failure and likely will require a defined lower section to act as a spillway. The spillway section may need to be additionally reinforced. The design of the drain from the storage are will need to prevent siltation of the downstream pipe. This will require ongoing maintenance and clearance of the inlet.
E	EA Long List Option 10	Spy Lane surface water overland flow interception bund and pond	Western corner of field bounded by Spy Lane and Guildford Road (also referred to as field south of Merryhills Lane)	95m long bund, with max height of 0.5m and 1m wide bund crest. 960m2 excavated area along inside of new bund to 0.5m depth from existing ground level. Drain at bed of ditch to stream via either new pipe or connection into existing road drainage along road (assuming road drainage connection to stream).	Farmers field, Spy Lane and potentially Guildford Road (or footpath along road).	Greater reduction in surface water flow along Spy Lane and limited surface water flow (flooding) through properties between Spy Lane and the stream. No reduction in fluvial flood water levels.	The scheme would result in a body of retained water with a crest level approximately 1m above the level of Spy Lane. Therefore there would an increased flood risk to the properties in the event of a failure of the bund. There is an additional risk of blockage of the drainage pipe or road drainage.				✓	The bund will need to be engineered to reduce the risk of breach failure and likely will require a defined lower section to act as a spillway. The spillway section may need to be additionally reinforced. The design of the drain from the storage are will need to prevent siltation of the downstream pipe. This will require ongoing maintenance and clearance of the inlet.

F	New proposal	Pond Close culvert upsizing and channel widening	Culvert at Pond Close crossing of stream	Widen 1.8m rectangular culvert to 2.3m in width. Assume retain existing culvert height (1.15m).	Pond Close (road), stream channel and properties on either side of both ends of the culvert (where channel widening would be required)	Reduction in fluvial flood water levels for properties on both sides of Pond Close, as well as upstream of Pond Close. Negligible increase in downstream peak flood water levels.	No specific risk			✓		Increasing the capacity of this culvert in isolation may increase downstream flood water levels. Therefore, the culvert should only be upsized if the culverts oat Oak Grove are also upsized.
G	EA Long List Option 18	Oak Grove south-western end culvert upsizing	Twin culvert private crossing of stream for no. 5 Oak Grove	Replace twin 1.2m circular culverts with 3m wide by 1.2m high box culvert. Replace brick parapet walls with railings to allow overtopping.	Stream channel and private access to 5 Oak Grove	Reduction in local fluvial flood water levels at Oak Grove as well as upstream, at Pond Close.	No specific risk			✓		The proposed width for the upsized culvert was derived as the current width from the outside edge of the existing twin culverts. The design of the culvert upsizing may determine that it would be cheaper to replace the culvert with a free-span concrete bridge, which would further improve the flood flow conveyance.
H	New proposal	Channel widening upstream of Oak Grove south-western end culvert	Channel upstream of culvert at south-western end of Oak Grove.	Widen channel bed to minimum 2.0m in width.	Stream channel and banks	Potential reduction in flood water levels at Oak Grove	No specific risk		✓	✓		This option would likely provide negligible benefit is undertaken in isolation.
I	New proposal	Oak Grove south-western end culvert parapet wall part removal	Brick wingwall for culvert at south-western end of Oak Grove.	Remove approximately 2m end length of brick wall.	Brick wall at no. 3 Oak Grove	Potential reduction in flood water levels to 4 Oak Grove, by the removal of a out of bank flow obstruction.	No specific risk		✓			None
J	EA Long List Option 18	Oak Grove south-eastern end culvert upsizing	Twin culvert private crossing of stream for no. 6 Oak Grove	Replace twin 1.2m circular culverts with 3m wide by 1.2m high box culvert.	Stream channel and private access to 6 Oak Grove	Reduction in local fluvial flood water levels at Oak Grove as well as upstream, at Pond Close, when combined with upsizing of upstream culvert.	No specific risk			✓		The proposed width for the upsized culvert was derived as the current width from the outside edge of the existing twin culverts. The design of the culvert upsizing may determine that it would be cheaper to replace the culvert with a free-span concrete bridge, which would further improve the flood flow conveyance.
K	New proposal	Oak Grove south-eastern end culvert desilting and parapet removal	Twin culvert private crossing of stream for no. 6 Oak Grove and landscaping at no. 7 Oak Grove.	Replace brick parapet walls with railings to allow overtopping and allow out-of-bank flooding to return to the stream channel.	Culvert parapet wall and landscaping (include low brick wall) at 7 Oak Grove	Reduction in peak surface water and out of bank fluvial flood water levels at Oak Grove. Likely significant benefit to no. 6 Oak Grove.	No specific risk		✓	✓		The works improve the conveyance of flood water levels in channel and removal of barriers preventing surface water or out-of-bank fluvial flooding draining to the stream channel downstream of the culvert.
L	Refinement to EA Long List Option 20 (general recommendation)	Walderslade (Oak Grove) channel and landscaping works	Stream reach downstream of culvert, between no. 6 and 7 Oak Grove	Widen channel bed to minimum 2.0m in width. Widening works likely to be limited to 10m to 12m reach immediately downstream of culvert.	Stream channel and banks	Potential reduction in peak upstream in channel flood levels and out of bank flooding.	No specific risk		✓	✓		The stream channel width and conveyance capacity is significantly reduced, in sections, as compared to upstream and downstream reaches. The works proposed would be to provide a more uniform stream section / flow capacity for the channel to ensure upstream properties are not unreasonably adversely affected.
M	Refinement to EA Long List Option 20 (general recommendation)	Pemberley (Spy Lane) channel and weir works	Stream channel through Pemberley (Spy Lane)	Widen channel bed to minimum 2.0m in width. Widening works likely to be limited to the lower section of the stream, after the low weir, where gabion baskets have been installed on the left bank. Lower existing concrete in-channel low flow weir by 0.2m.	Stream channel and banks, as well as existing low in-channel weir	Potential reduction in peak upstream in channel flood levels and out of bank flooding.	No specific risk		✓	✓		The weir crest level is approximately 200mm higher than the upstream culverts invert level. Lowering the weir by 200mm should therefore not significantly alter the purpose of the weir, which is assumed to maintain minimum water levels during low flow conditions. It is recommended that the weir be wholly replaced, if required to be maintained, as site inspection suggested that due to upstream scour, low flows pass beneath the weir.

N	New and refinement to EA Long List Option 20 (general recommendation)	Trehenny (Spy Lane) culvert and channel works	Stream channel through Trehenny (Spy Lane	Widen the stream channel to minimum 2.0m bed width. Replace existing 1m dia culvert with either box culvert or freespan bridge desk, to width of channel.	Stream channel and banks, as well as existing restrictive culvert	Potential reduction in peak upstream in channel flood levels and out of bank flooding.	No specific risk		✓	✓		Widening of the channel upstream of the culvert and installed decking is potentially complicated by two unknown assumed service pipes passing across the channel at top of bank level. Reinforcement works may be required to ensure the existing 'pipe' are adequately supported over the increased channel width.
O	New proposal	Loxwood Primary School surface water interception swale and culvert	Loxwood Primary School	Approx. 2.7m top width and 0.3m deep swale drained via a 100m long, 450mm diameter pipe, drain to the stream.	Landscaping of school greenspace area and drainage	Interception of overland surface water flow route to reduce or remove property flooding at Burley Close	No specific risk		✓	✓		The proposed swale are located in an assumed play / greenspace areas. It should be possible for the swale and drain entrance to be designed so as not to pose a risk to school pupils. The route of the drainage pipe to the stream may be complicated by existing landscaping and buildings along the southern boundary of the school. A site walkover is required to understand alignment constraints.
P	New proposal	3 Burley Close surface water interception swale and culvert connection to Loxwood Primary School surface water interception culvert	Loxwood Primary School and no. 3 Burley Close	Up to 0.5m deep swale / interception drain, drained by 0.45m diameter pipe to school interception drainage pipe.	Property landscaping and drainage	Improved interception of overland surface water flow route to reduce or remove property flooding at Burley Close.	No specific risk		✓	✓		The proposed swale along the western site boundary may require bunding along the eastern bank to effectively intercept overland surface water flow. However the design will need to ensure that the interception feature does not increase flooding to the upstream (western) property. In the event that the pipe drainage cannot connect into the school interception pipe drain, then a drainage could rather connect directly to outfall into the stream.
Q	EA Long List Option 33	Burley Close flood defence wall	Top of right stream bank along rear of no. 4, 5 and 6 Burley Close	Up to 0.6m high flood defence, with a crest height at 20.6mAOD, for the section along Station Road and along no. 5 and 6 Burley Close. Crest height of 20.7mAOD for the upstream wall section on no. 4 Burley Close boundary	Stream top of bank and property landscaping.	Prevention of fluvial source of flooding to Burley Close properties.	The flood wall would provide a barrier to flooding in Burley Close to overtop into the stream.		✓	✓		This option requires the interception of overland surface water flooding from reaching Burley Close. The works should also consider maximising the potential surface water drainage provided for Burley Close to ensure any water is drained to the stream as fast and as soon as possible.
R	New proposal	Burley Close road entrance raising	Junction of Burley Close with Station Road	Construct raised road entrance table, raising existing level up by up to 0.5m. Raise adjacent pedestrian footpaths and soft landscaping to crest at or above entrance table level.	Burley Close and junction with Station Road	Barrier to surface water runoff flowing down Station Road from entering Burley Close. Reduction or removal of property flooding at Burley Close.	The raised entrance would provide a barrier to flood waters in Burley Close flow out via Station Road and into the stream.		✓	✓		This option requires the interception of overland surface water flooding from reaching Burley Close. The works should also consider maximising the potential surface water drainage provided for Burley Close to ensure any water is drained to the stream as fast and as soon as possible.
S	EA Long List Option 25	Station Road upsize culvert	Bridge / culvert under Station Road	Replace existing 1.66m wide brick arch culvert with a 3m wide rectangular culvert. Retain low flow bed channel shape and existing culvert height to soffit of 0.885m.	Station Road and left bank of channel immediately upstream and downstream of culvert	Reduction in upstream in channel water levels, reducing overtopping and flooding of Burley Close.	No specific risk				✓	The potential increasing of the culvert is limited by existing services passing across the bed of the culvert as well as the electrical substation on the downstream right bank. The culvert can therefore only likely be widened on the left bank. The existing services that may be affected by this options are unknown.
T	EA Long List Option 26	Station Road high level overflow pipe	Bridge / culvert under Station Road	Include new 0.6m diameter circular pipe to the left of existing arch culvert. Height of new pipe set by matching soffit level of new pipe with existing culvert. New pipe invert level at approximately 340mm high above bed level.	Station Road and left bank of channel immediately upstream and downstream of culvert	Reduction in upstream in channel water levels, reducing overtopping and flooding of Burley Close.	No specific risk				✓	The potential for including a high level bypass is limited to the left side of the existing culvert due to the electrical substation on the downstream right bank. The potential size of the high level bypass is also limited by the existing low level of the road and existing culvert soffit. The existing services that may be affected by this options are unknown.
U	Flood Forum additional request / EA Long List Option 20 (general recommendation)	Stream widening downstream of Station Road	160m reach of stream downstream of Station Road culvert.	Widen stream bed channel by 1m along left bank of stream	Stream channel and left bank alignment	Reduction in upstream flood water levels, reducing fluvial overtopping and flooding of Burley Close.	None		✓	✓		This option should be considered if possible, even with all proposed options for Burley Close, as at minimum it would provide benefit for potential flooding / overtopping of Station Road.