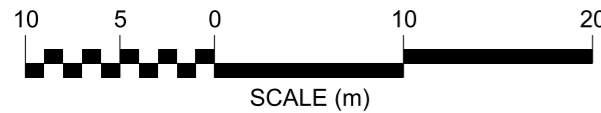
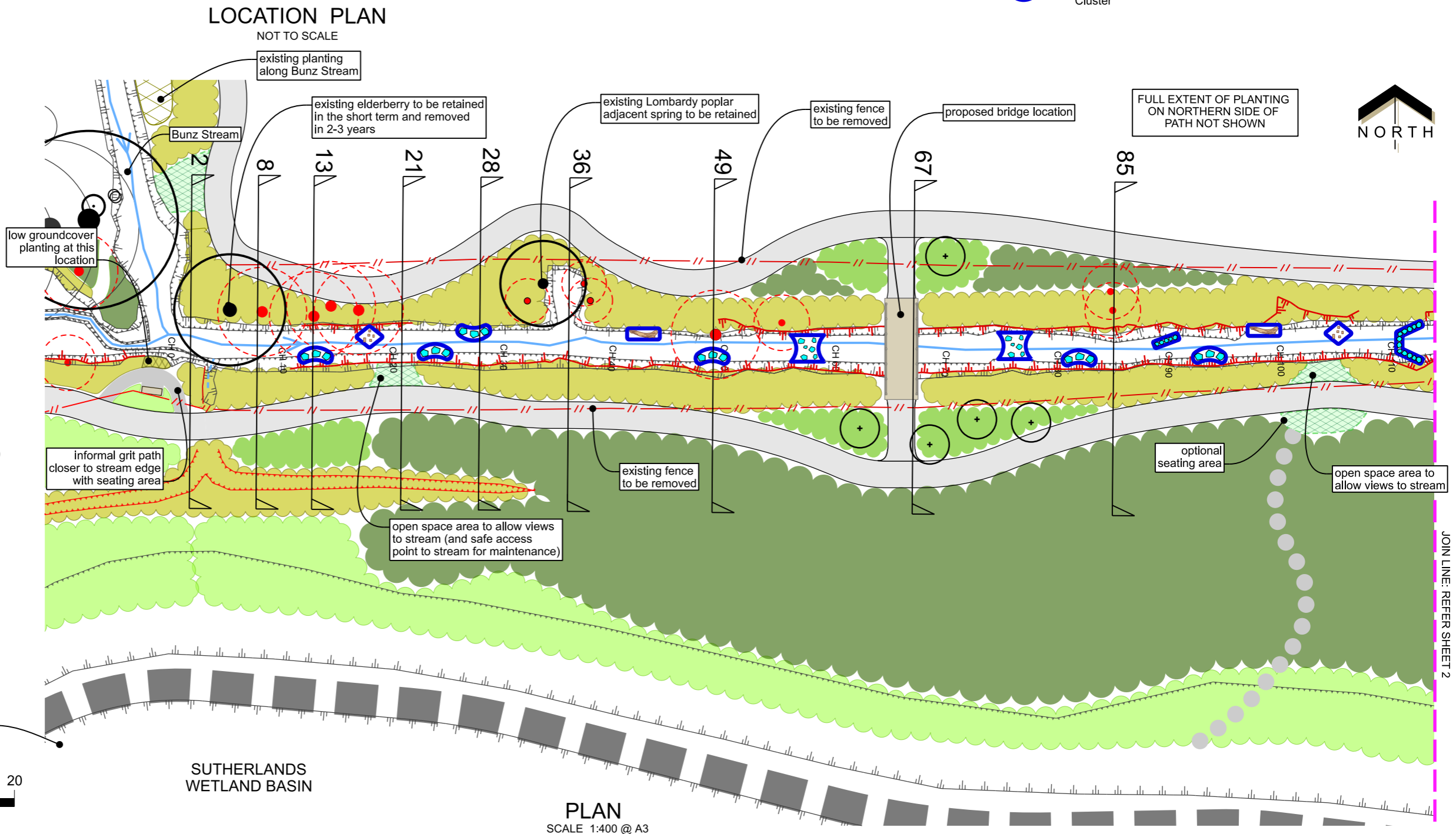


### INSTREAM FEATURES (refer Sheets 11-14 for details)

- |  |                                |  |                         |
|--|--------------------------------|--|-------------------------|
|  | A - Rock Edge                  |  | G - Timber Edge         |
|  | B - Rock Vane                  |  | H - Timber Post Snag    |
|  | C - Rock Cross Vane            |  | I - Root Wad Edge       |
|  | D - J-Hook Vane                |  | J - Log Snag            |
|  | E - Riffle                     |  | K - Rock Retaining Edge |
|  | F - Boulder and Cobble Cluster |  | N - Log Edge            |

### KEY

- existing tree to be retained
- existing tree to be removed (stump removed if possible)
- existing tree to be removed stump retained
- tree stumps to be retained
- existing top of bank
- existing stormwater pipe
- proposed top bank
- proposed riparian margin planting
- proposed indigenous forest planting
- proposed native buffer planting (typically groundcovers)
- proposed open area for stream viewing, groundcover option of grass and/or low groundcover planting and/or grit surface (exact location to be determined on site)
- proposed specimen tree
- proposed grit path with batten edges (typically 2.4m or 1.5m wide)
- proposed informal grit path without batten edges (exact location to be determined on site)
- potential informal trail/bark mulch path through planting (exact location to be determined on site)



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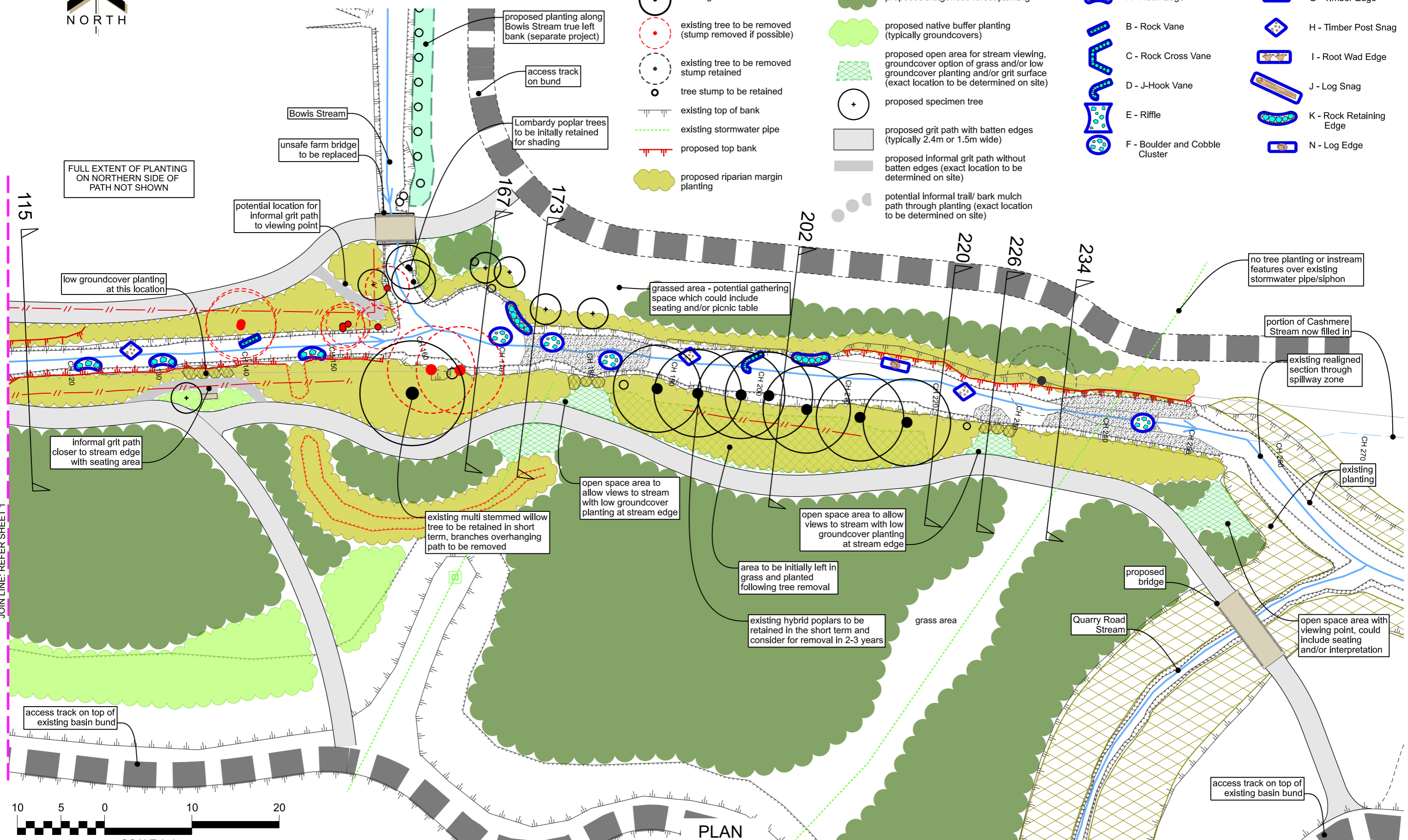


### KEY

- existing tree to be retained
- existing tree to be removed (stump removed if possible)
- existing tree to be removed stump retained
- tree stump to be retained
- existing top of bank
- existing stormwater pipe
- proposed top bank
- proposed riparian margin planting
- proposed indigenous forest planting
- proposed native buffer planting (typically groundcovers)
- proposed open area for stream viewing, groundcover option of grass and/or low groundcover planting and/or grit surface (exact location to be determined on site)
- proposed specimen tree
- proposed grit path with batten edges (typically 2.4m or 1.5m wide)
- proposed informal grit path without batten edges (exact location to be determined on site)
- potential informal trail/ bark mulch path through planting (exact location to be determined on site)

### INSTREAM FEATURES (refer Sheets 11-14 for details)

- A - Rock Edge
- B - Rock Vane
- C - Rock Cross Vane
- D - J-Hook Vane
- E - Riffle
- F - Boulder and Cobble Cluster
- G - Timber Edge
- H - Timber Post Snag
- I - Root Wad Edge
- J - Log Snag
- K - Rock Retaining Edge
- N - Log Edge



Original size mm  
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0  
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SCALE (m)  
PLAN  
SCALE 1:400 @ A3  
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JOIN LINE: REFER SHEET 1



## CASHMERE STREAM ENHANCEMENT PROPOSALS STAGE 1B - 2

### SHEET 2: CHAINAGE 115 - 260 (UPSTREAM OF SPILLWAY)

Original Plan Size: A3  
 ISSUE.2 08/2022  
 LP400801 FG/GW CP503560





Original size mm

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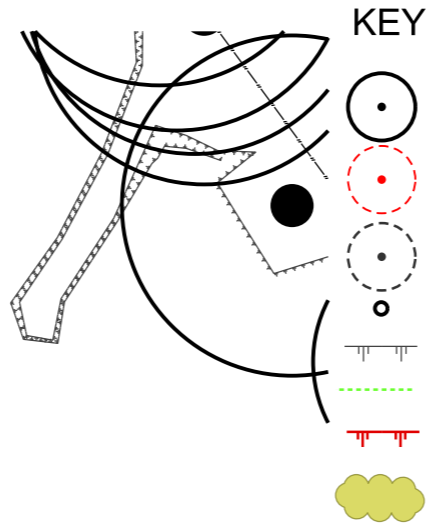
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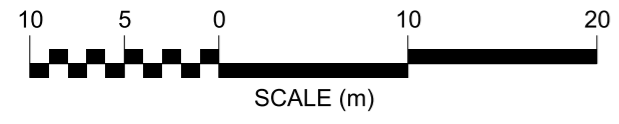
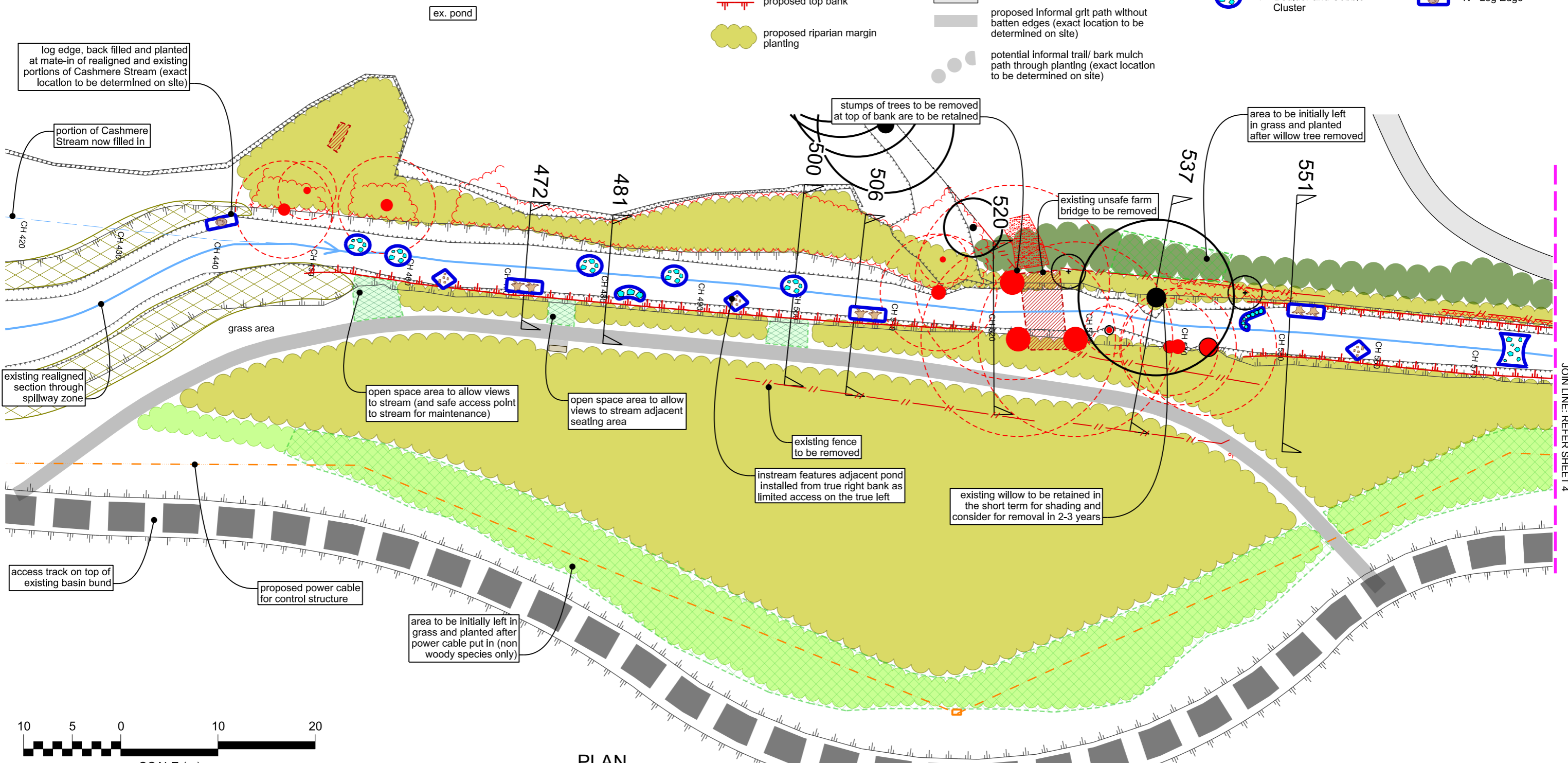
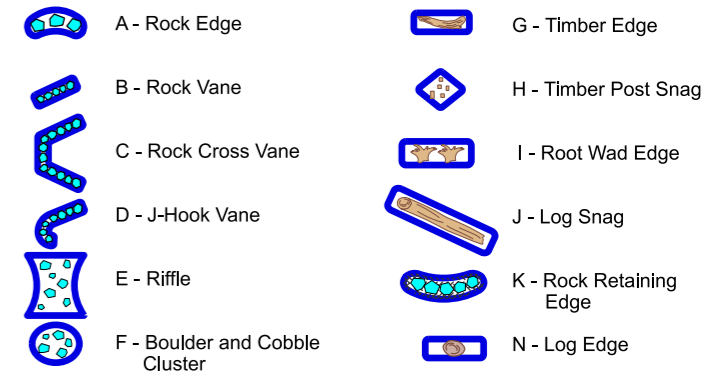
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### INSTREAM FEATURES (refer Sheets 11-14 for details)



PLAN  
SCALE 1:400 @ A3



# CASHMERE STREAM ENHANCEMENT PROPOSALS STAGE 1B - 2

SHEET 3: CHAINAGE 440 - 580 (DOWNSTREAM OF SPILLWAY)

Original Plan Size: A3  
ISSUE.2  
LP400801 FG/GW CP503560

JOIN LINE: REFER SHEET 4



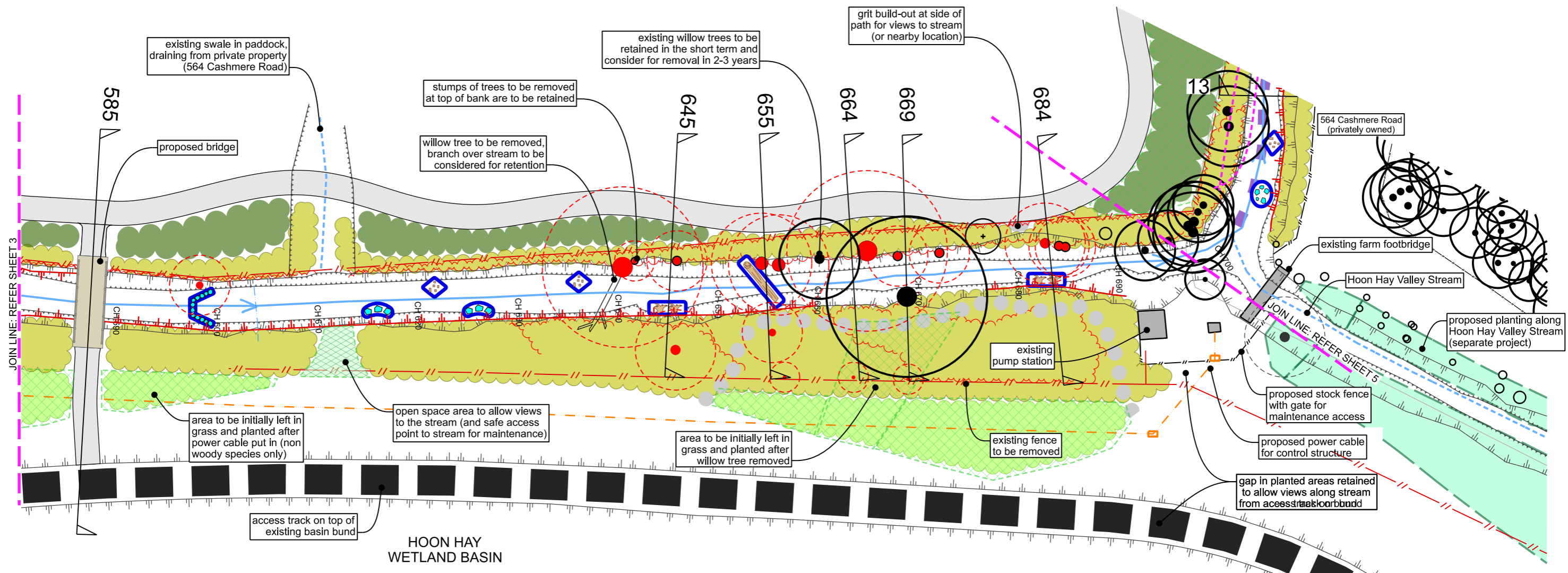
### KEY

- existing tree to be retained
- existing tree to be removed (stump removed if possible)
- existing tree to be removed stump retained
- tree stump to be retained
- existing top of bank
- proposed top bank
- existing stormwater pipe
- proposed riparian margin planting

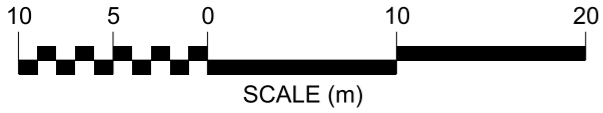
- proposed indigenous forest planting
- proposed native buffer planting (typically groundcovers)
- proposed open area for stream viewing, groundcover option of grass and/or low groundcover planting and/or grit surface (exact location to be determined on site)
- proposed specimen tree
- proposed grit path with batten edges (typically 2.4m or 1.5m wide)
- proposed informal grit path without batten edges (exact location to be determined on site)
- potential informal trail/ bark mulch path through planting (exact location to be determined on site)

### INSTREAM FEATURES (refer Sheets 11-14 for details)

- A - Rock Edge
- B - Rock Vane
- C - Rock Cross Vane
- D - J-Hook Vane
- E - Riffle
- F - Boulder and Cobble Cluster
- G - Timber Edge
- H - Timber Post Snag
- I - Root Wad Edge
- J - Log Snag
- K - Rock Retaining Edge
- N - Log Edge



PLAN  
SCALE 1:400 @ A3



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JOIN LINE: REFER SHEET 3

JOIN LINE: REFER SHEET 5



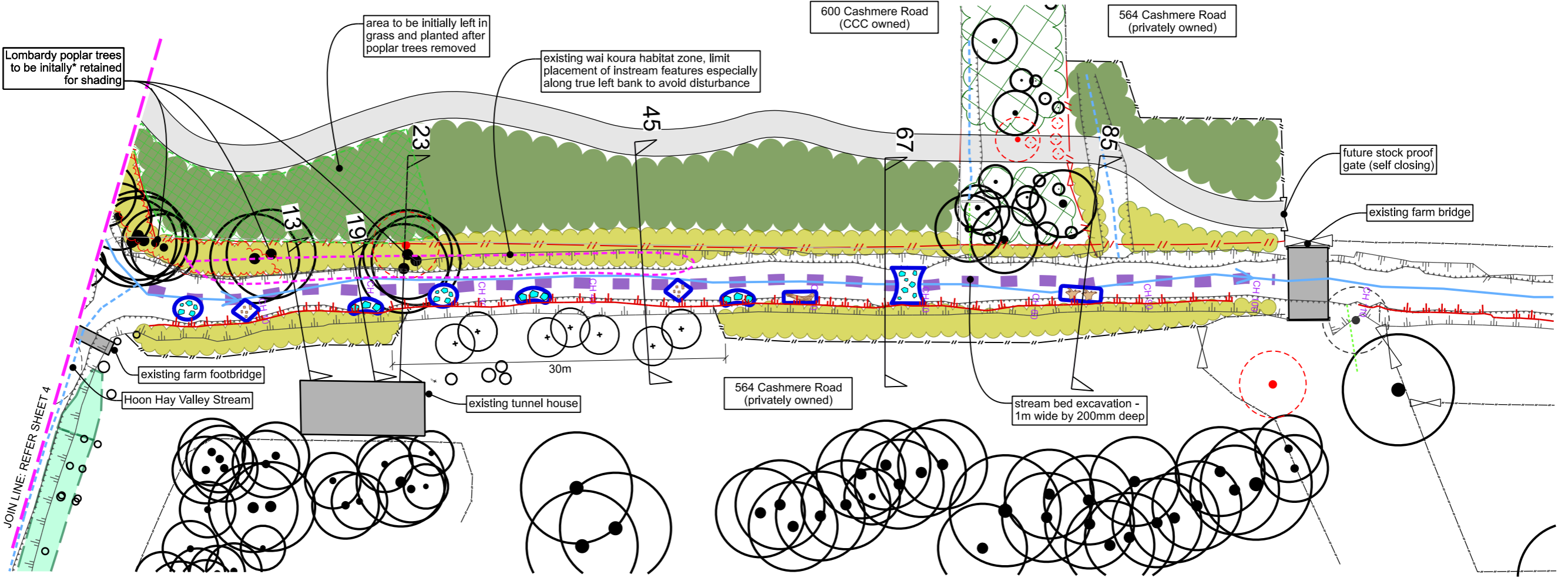
# INSTREAM FEATURES (refer Sheets 11-14 for details)

- A - Rock Edge
- B - Rock Vane
- C - Rock Cross Vane
- D - J-Hook Vane
- E - Riffle
- F - Boulder and Cobble Cluster
- G - Timber Edge
- H - Timber Post Snag
- I - Root Wad Edge
- J - Log Snag
- K - Rock Retaining Edge
- N - Log Edge

## KEY

- existing tree to be retained
- existing tree to be removed (stump removed if possible)
- existing tree to be removed stump retained
- tree stump to be retained
- existing top of bank
- existing stormwater pipe
- proposed top bank
- proposed riparian margin planting
- proposed indigenous forest planting
- proposed native buffer planting (typically groundcovers)
- proposed open area for stream viewing, groundcover option of grass and/or low groundcover planting and/or grit surface (exact location to be determined on site)
- proposed specimen tree
- proposed grit path with batten edges (typically 2.4m or 1.5m wide)
- proposed informal grit path without batten edges (exact location to be determined on site)
- potential informal trail/ bark mulch path through planting (exact location to be determined on site)
- extent of stream bed excavation (1m wide by 200mm deep)

\* Proposed staged removal of Lombardy poplar.  
 In Year 1:  
 - reduce the height of the tree by approx. one half;  
 - drill and fill the tree with herbicide (glyphosate);  
 Year 2 - 3:  
 - further reduce height of tree to close to ground and repeat herbicide treatment;  
 - stump left in bank to naturally decay.



PLAN  
SCALE 1:400 @ A3

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Original size mm

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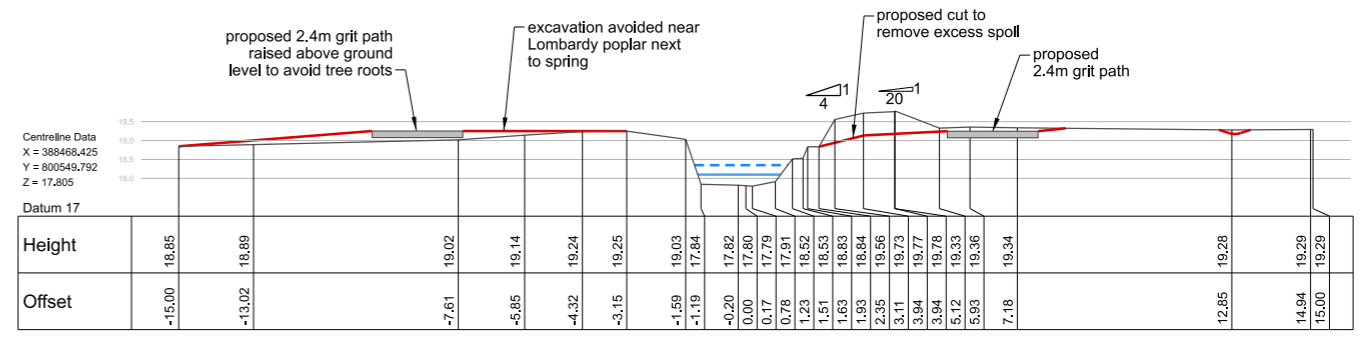
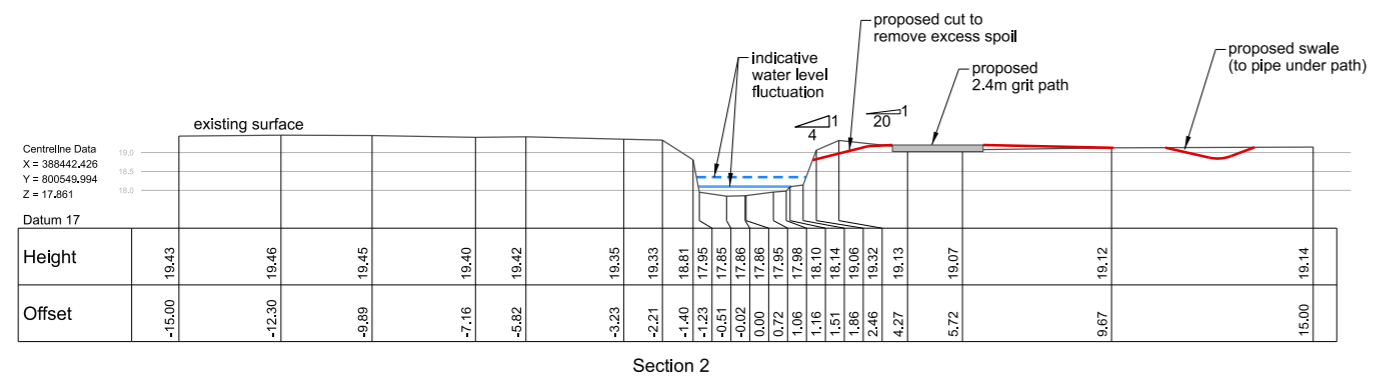
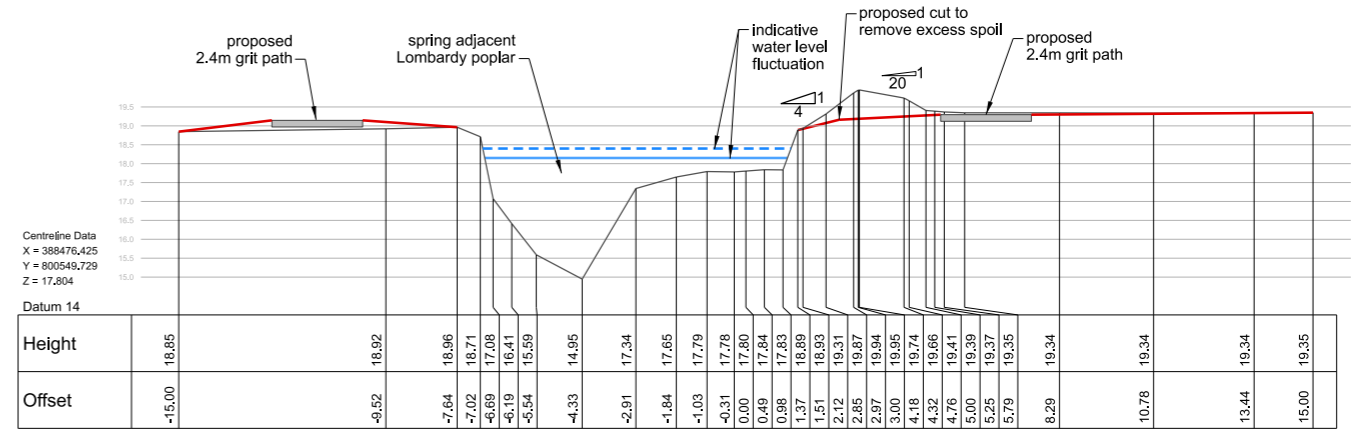
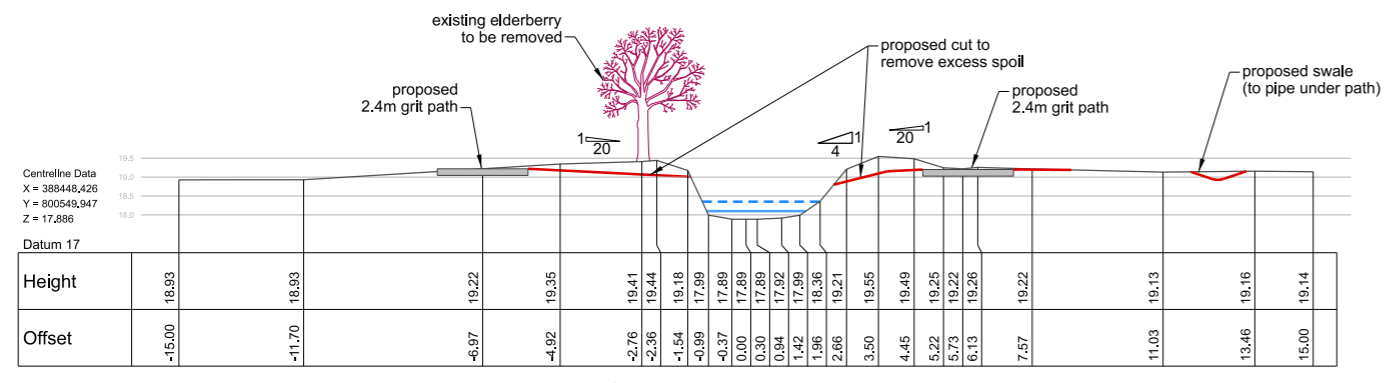
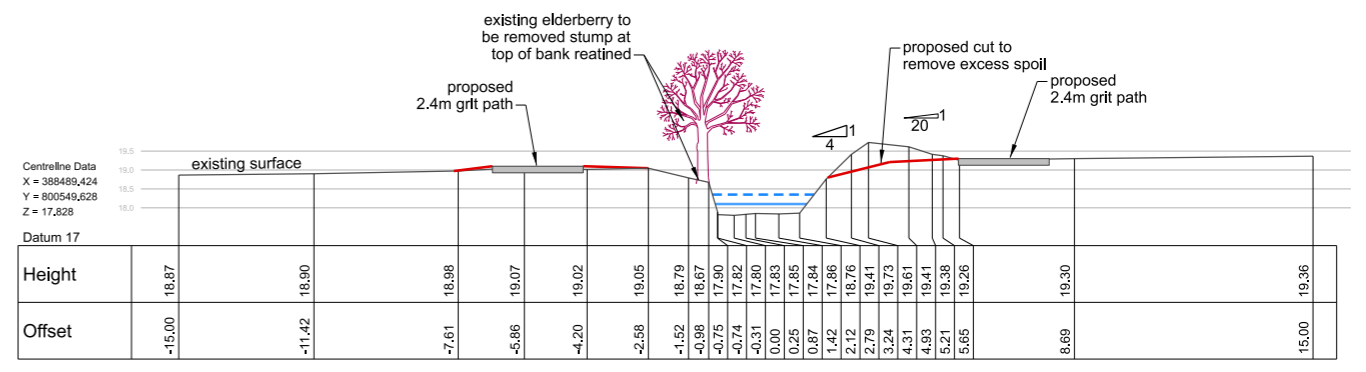
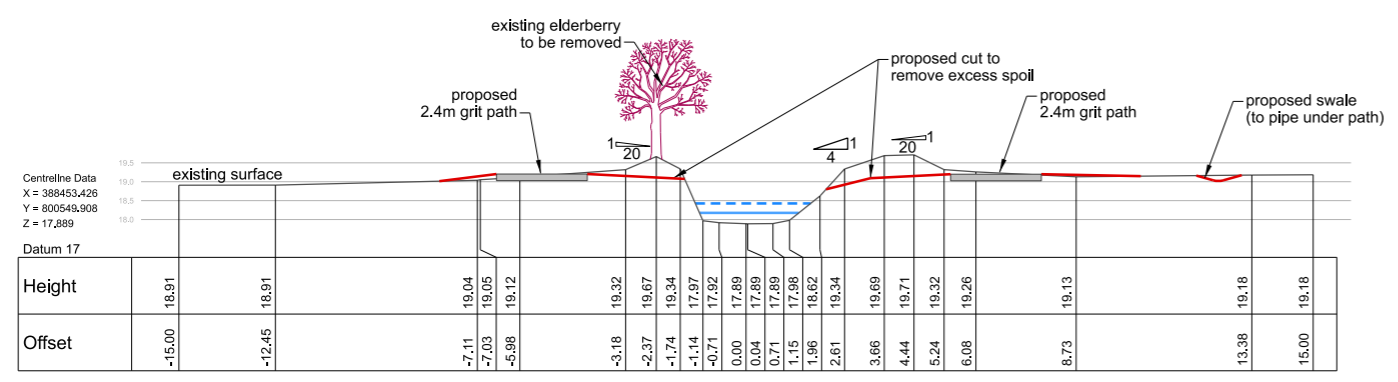
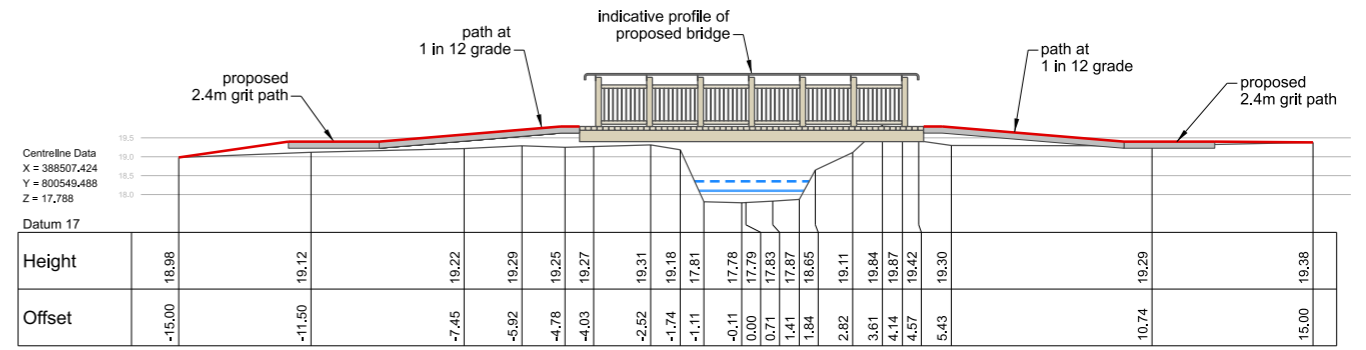
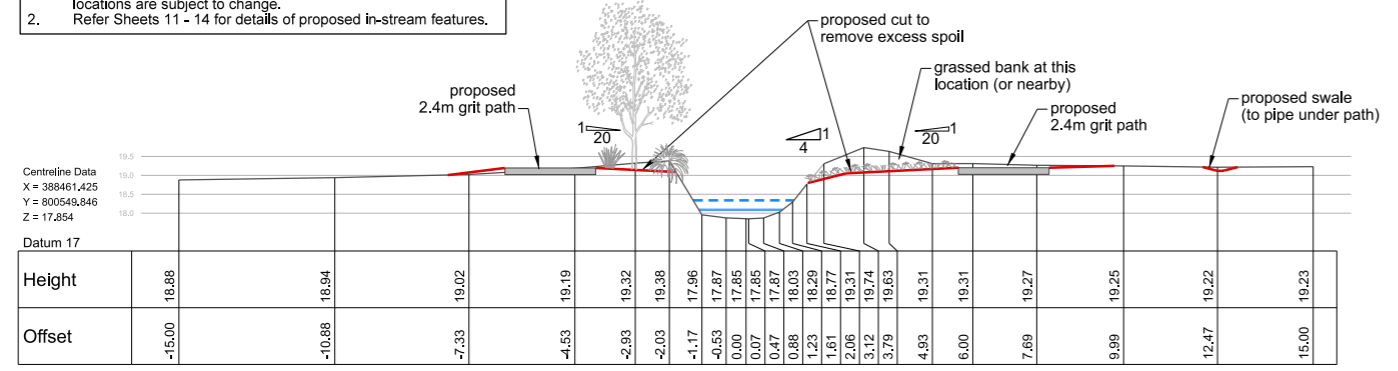
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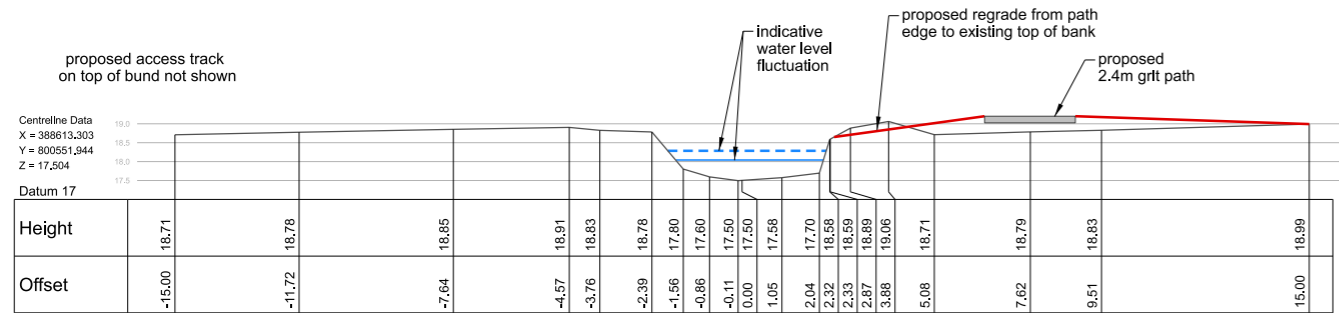
**NOTES:**

- Proposed in-stream features are not shown on these section as locations are subject to change. Refer Sheets 11 - 14 for details of proposed in-stream features.

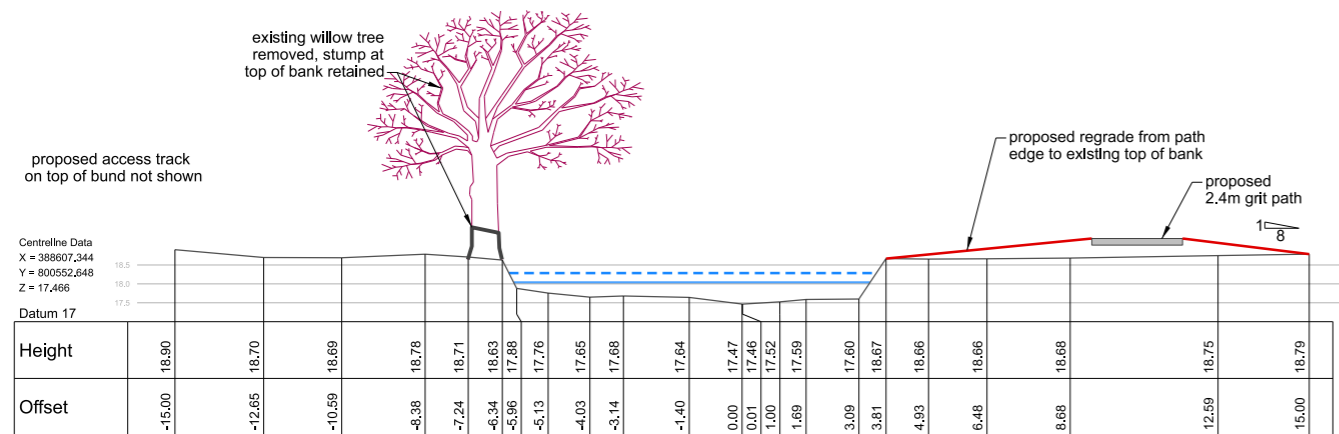




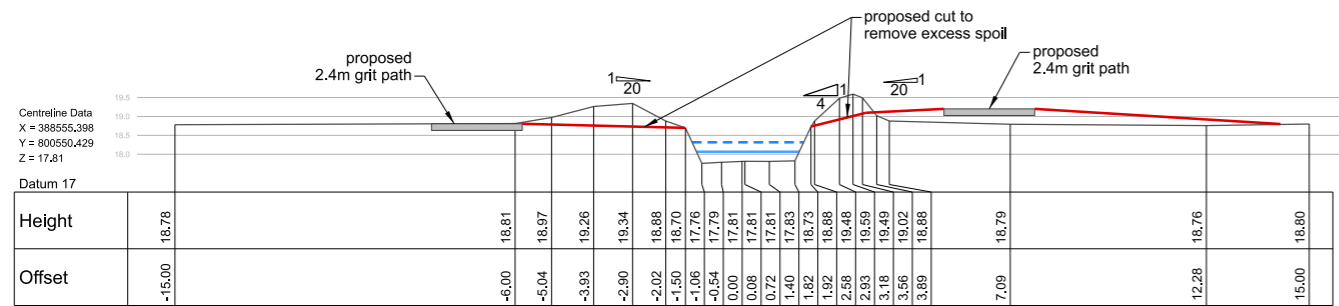
- NOTES:
- Proposed in-stream features are not shown on these section as locations are subject to change.
  - Refer Sheets 11 - 14 for details of proposed in-stream features.



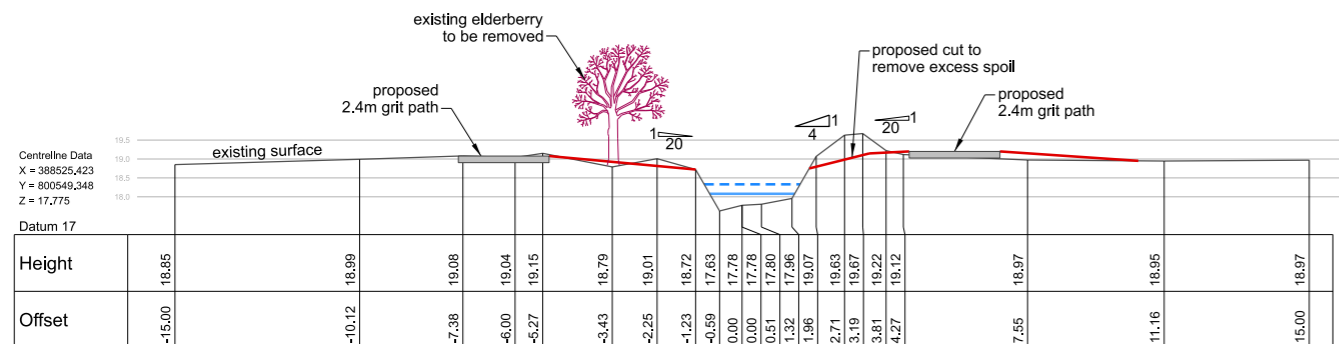
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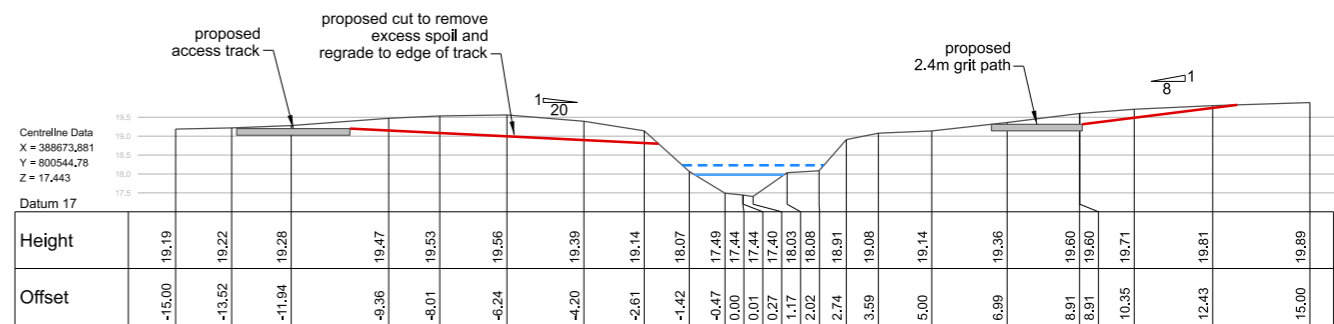
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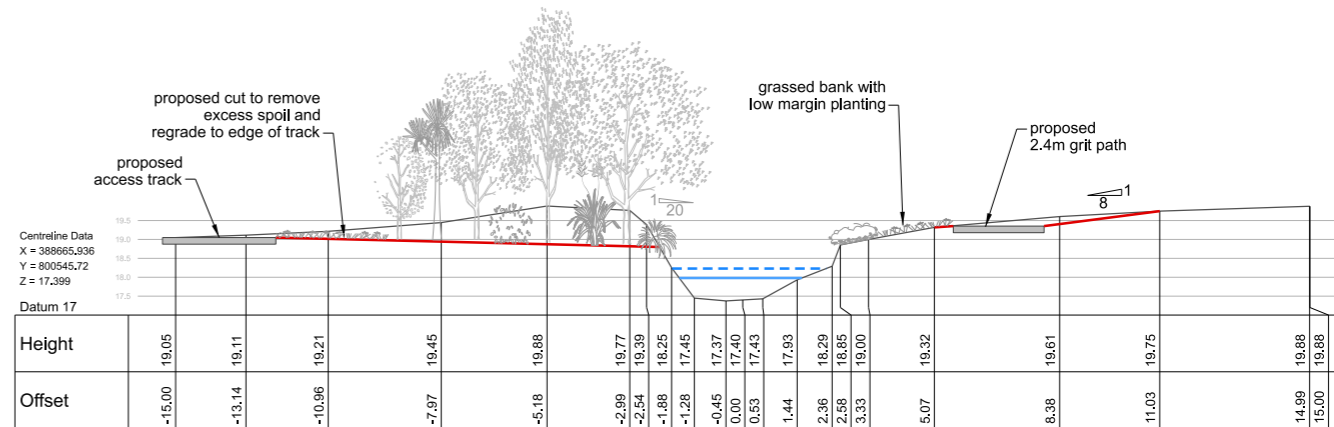
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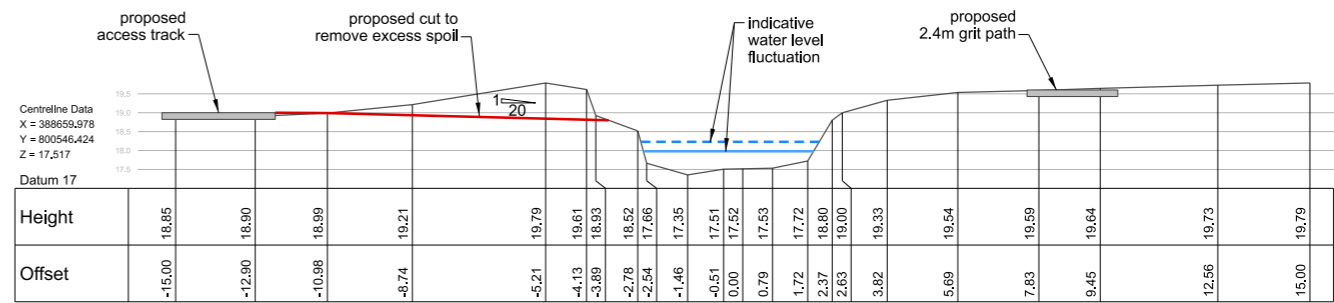
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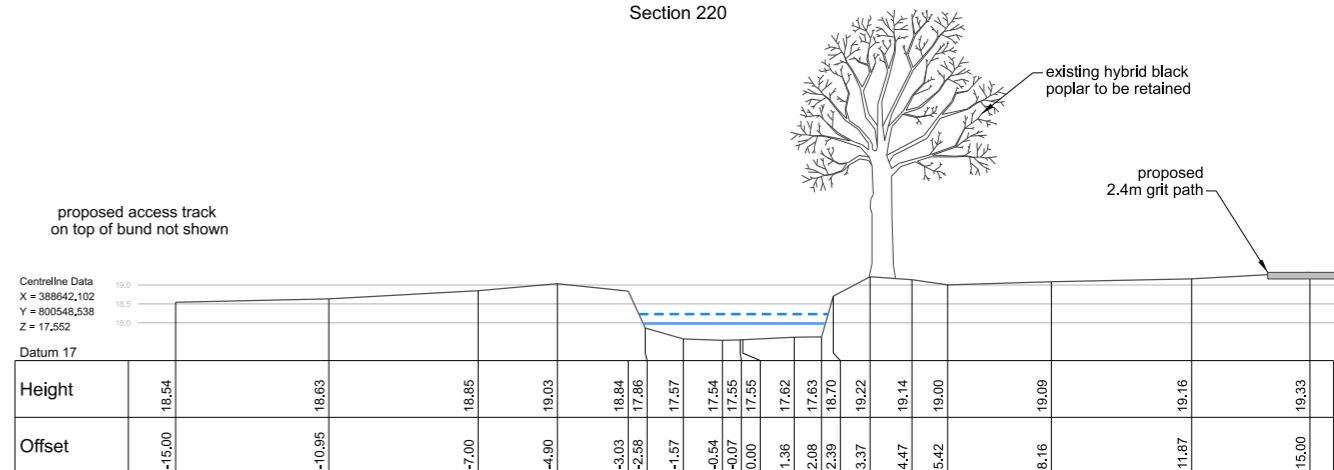
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Section 226

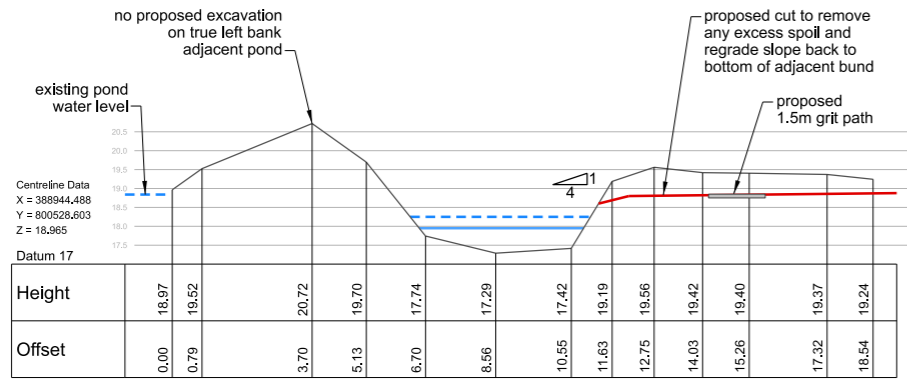


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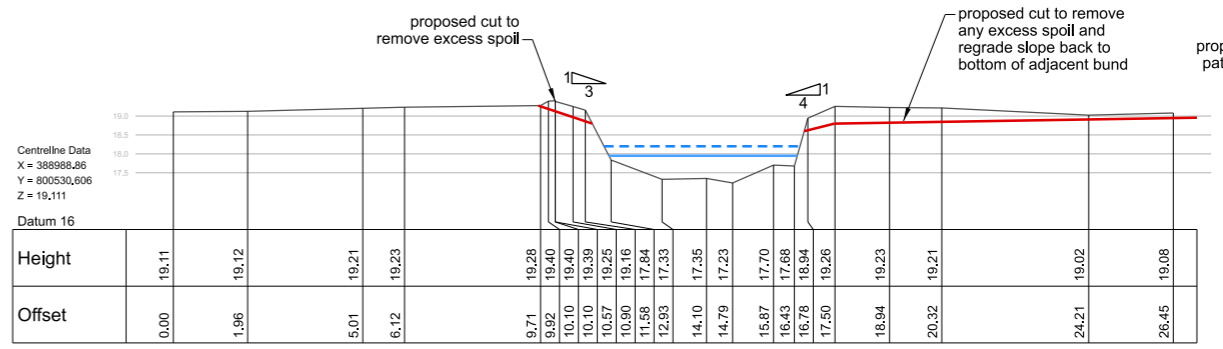


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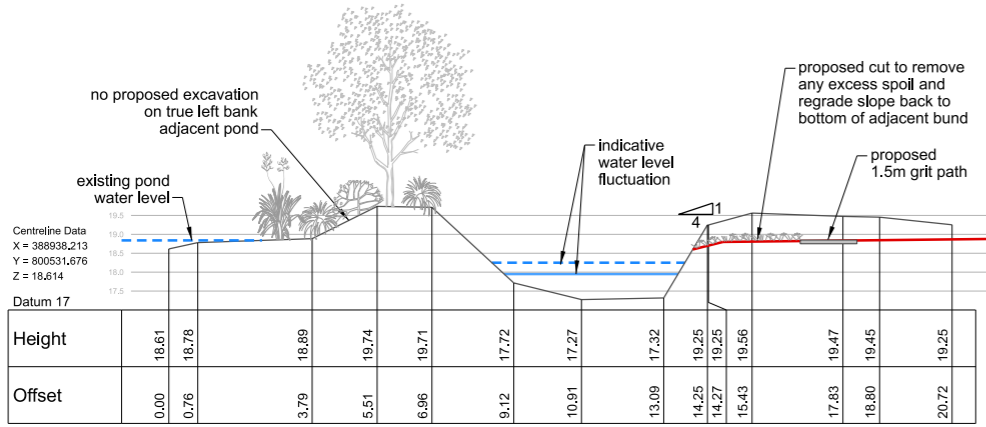
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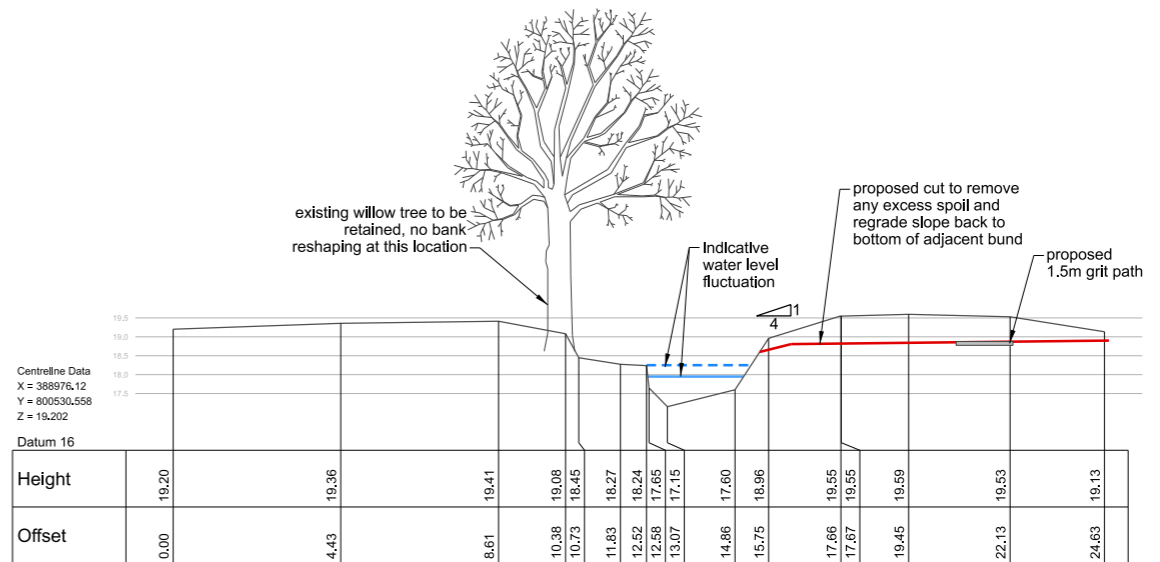
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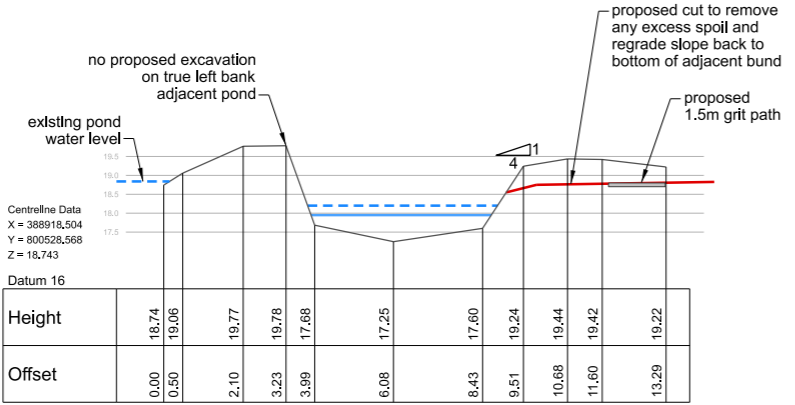
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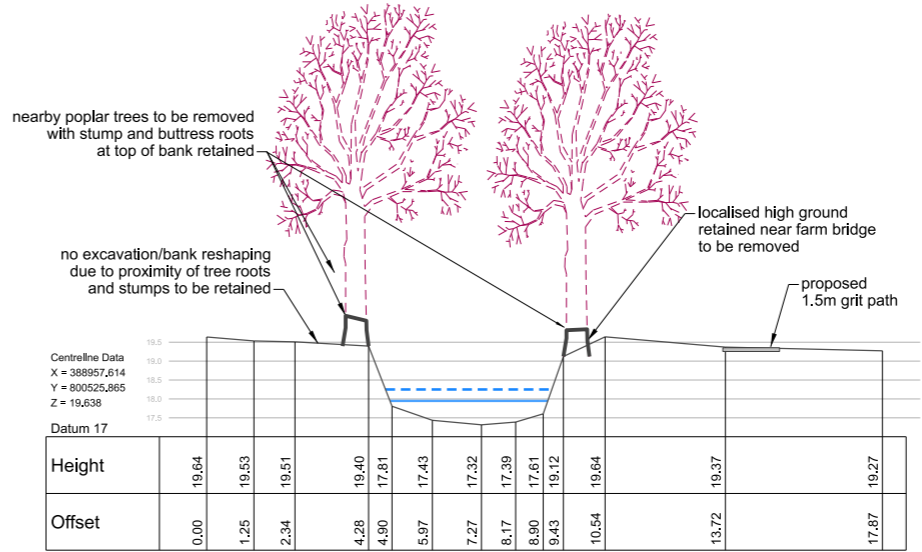
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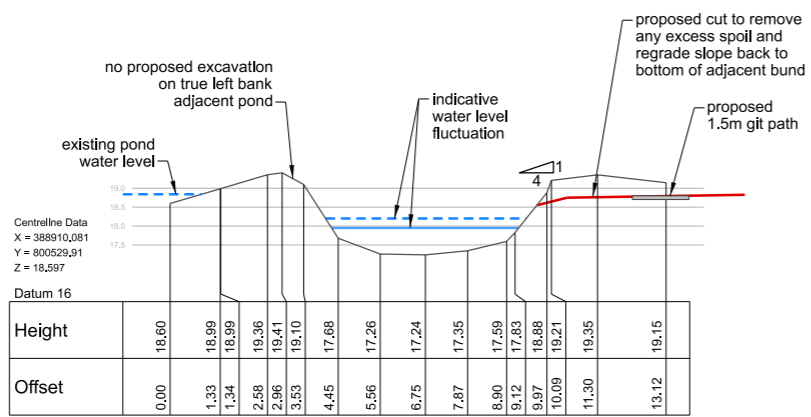
Section 537



Section 481



Section 520

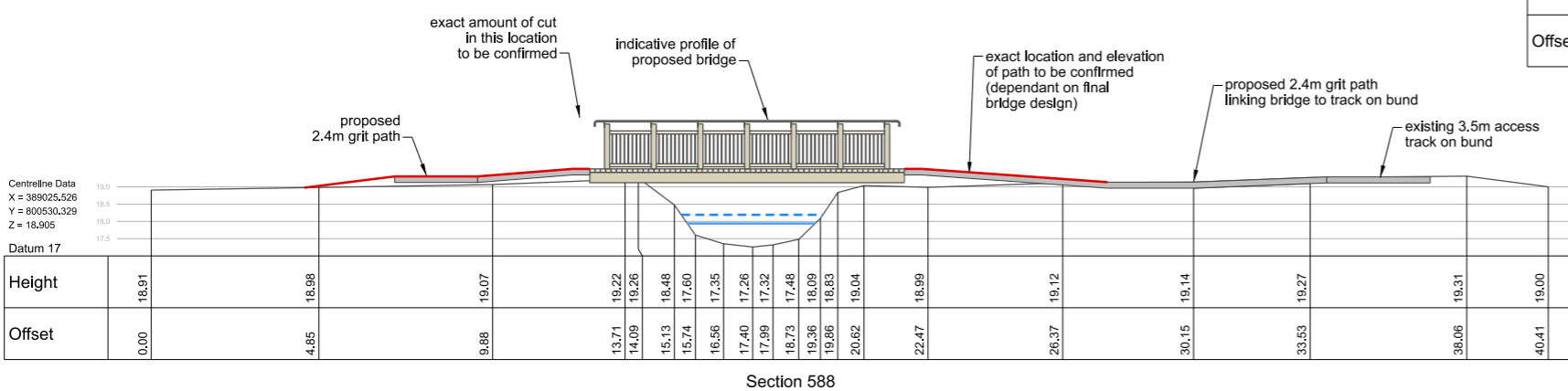
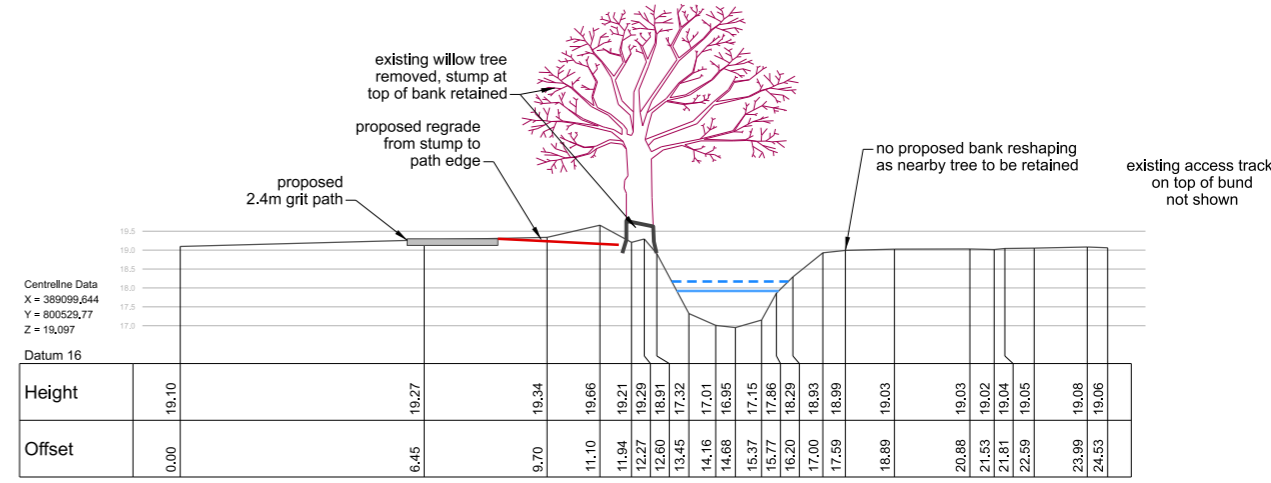
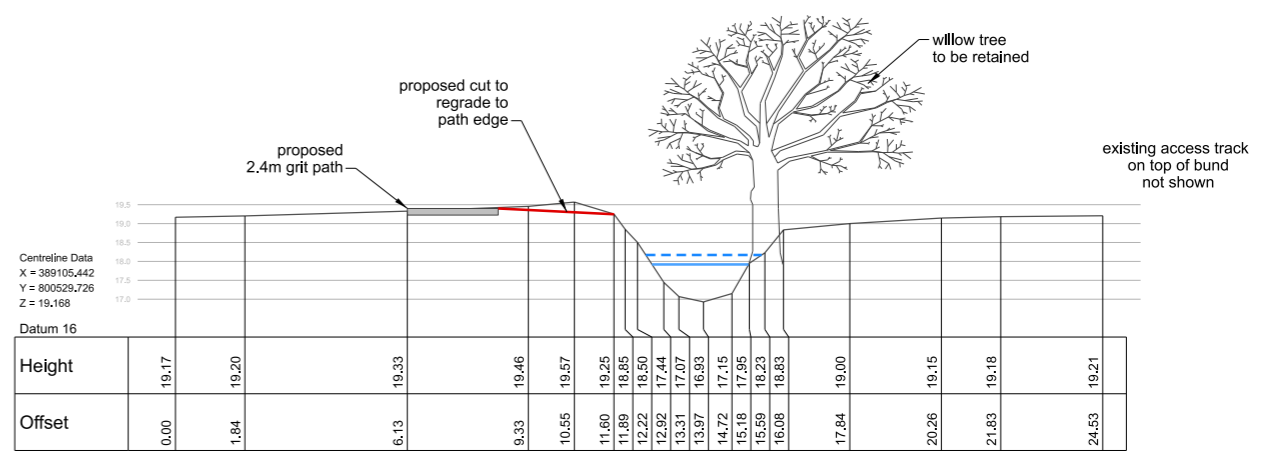
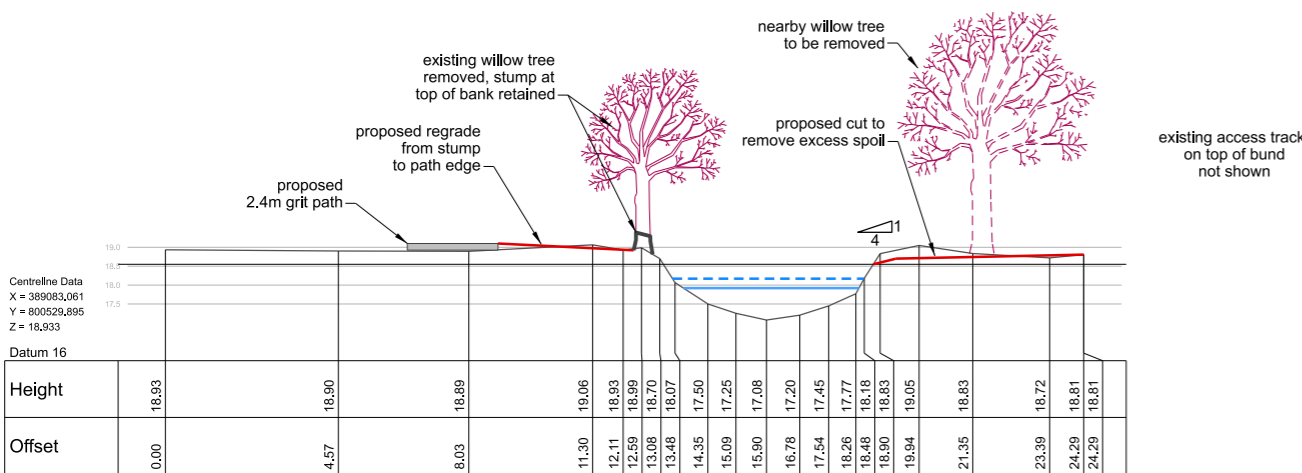
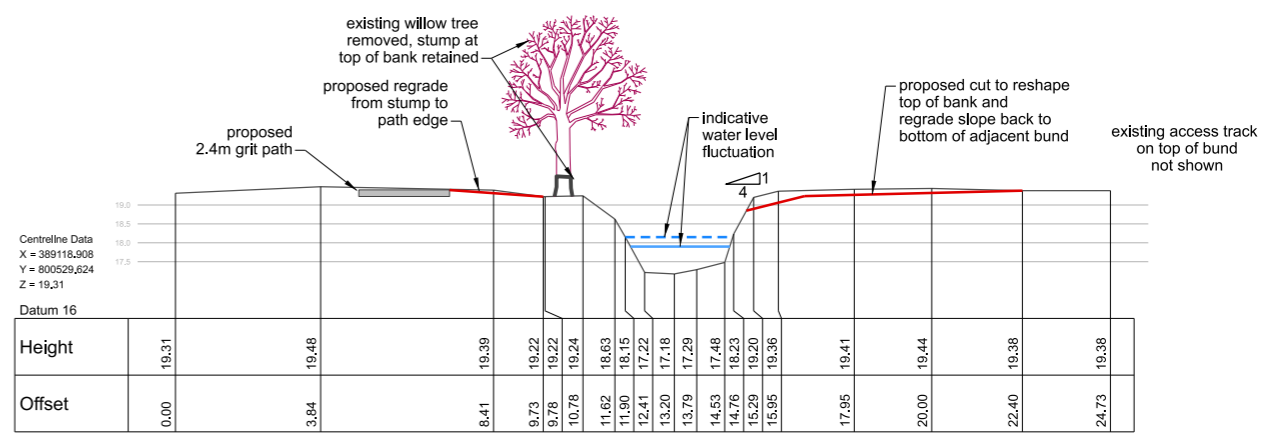
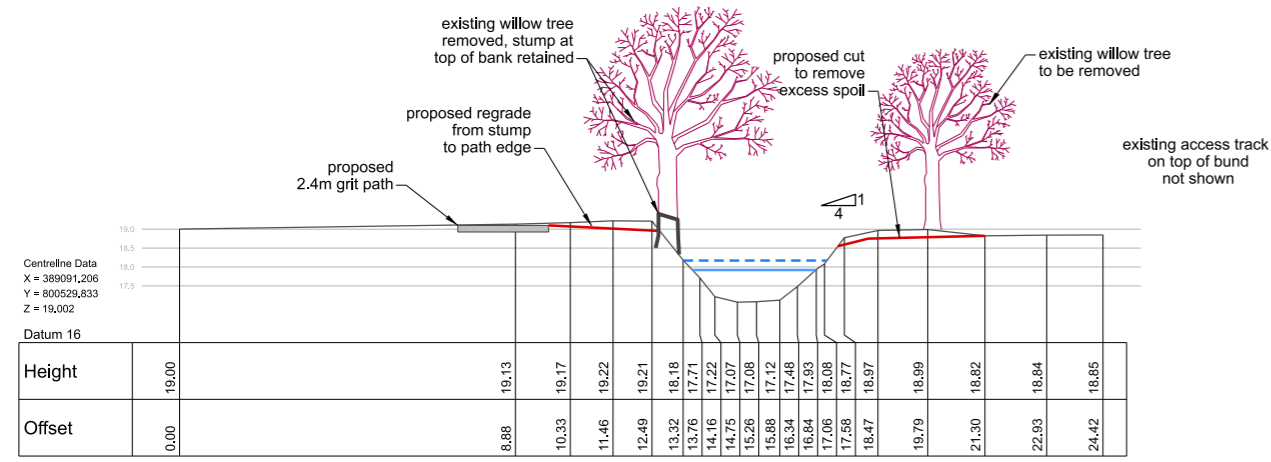


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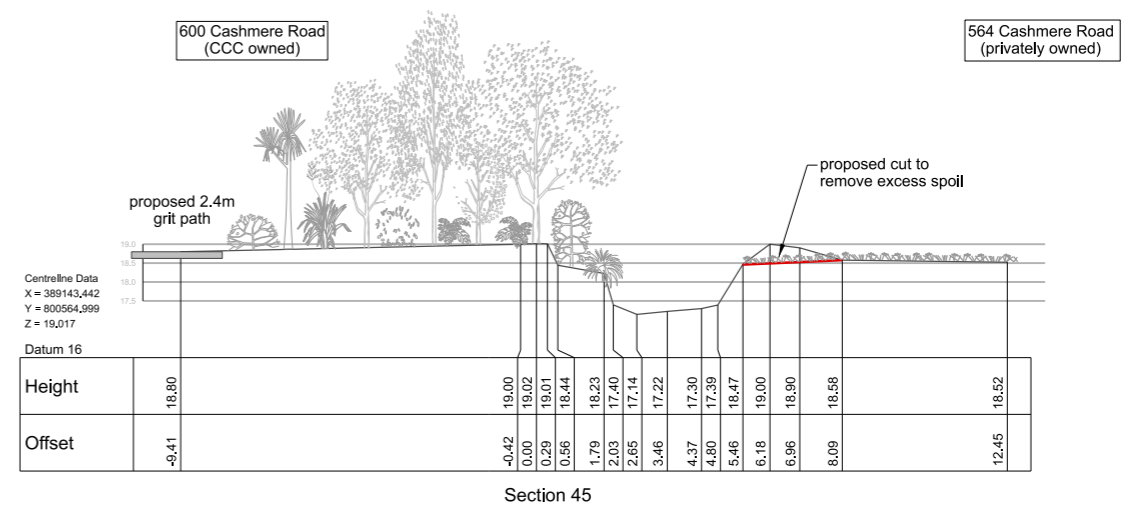
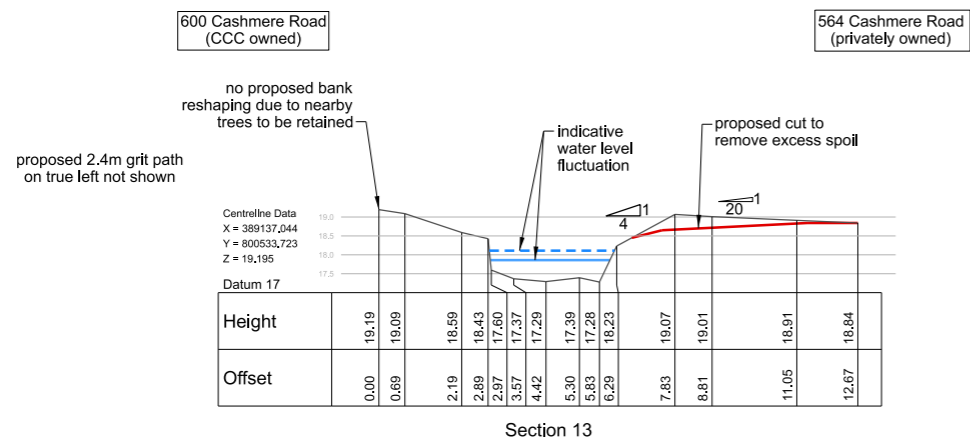
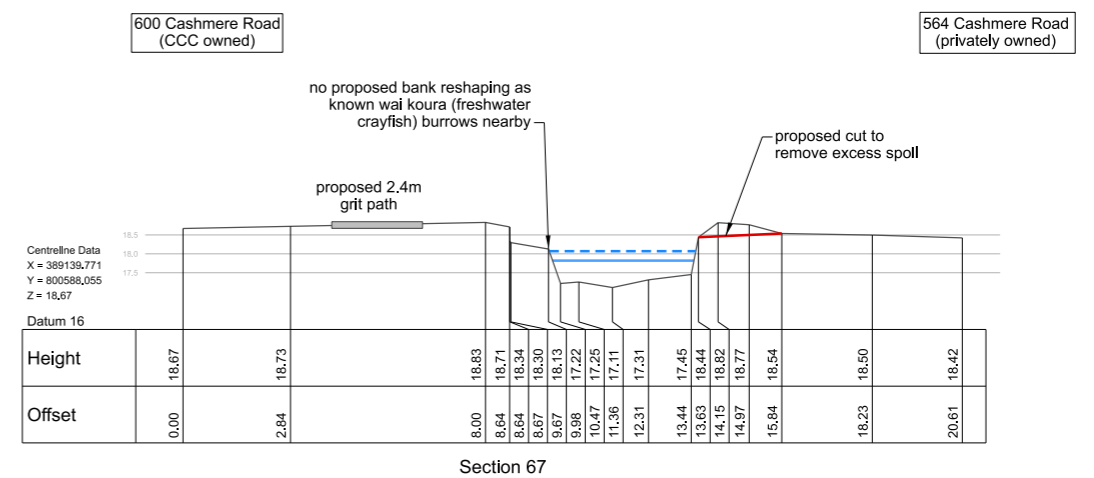
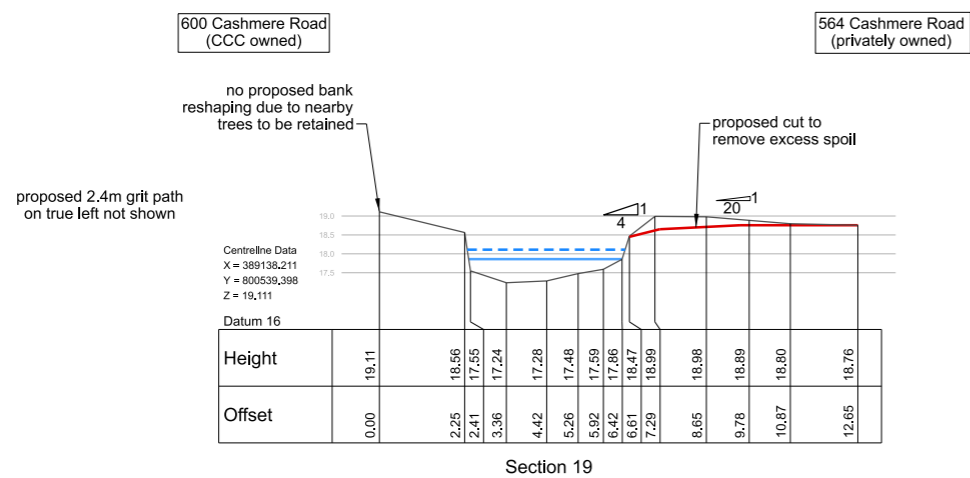
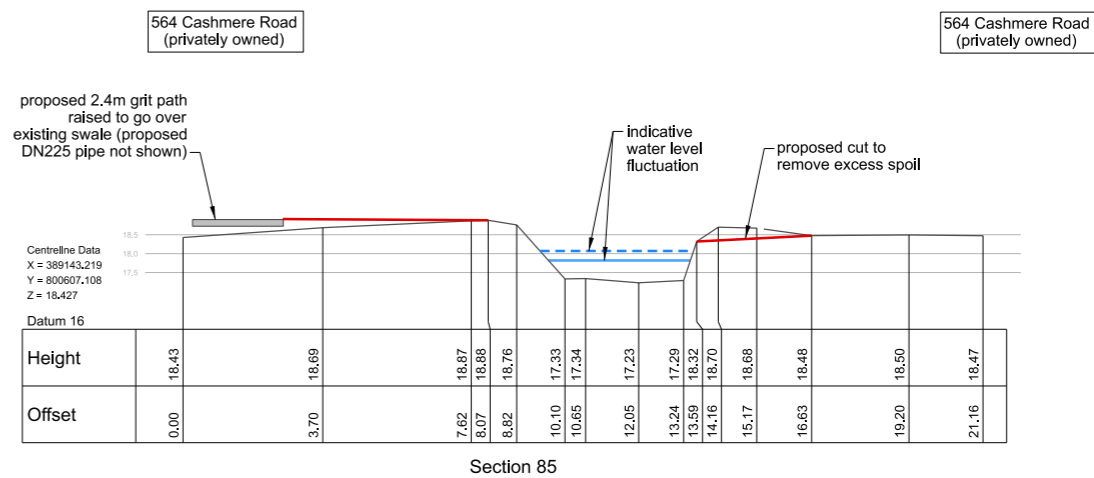
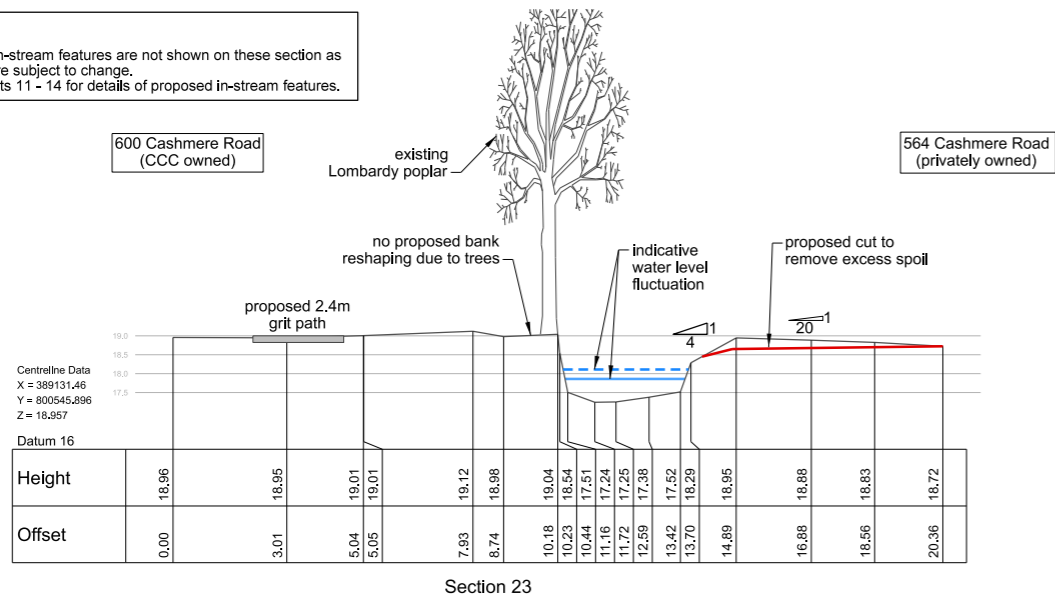
NOTES:  
1. Proposed in-stream features are not shown on these sections as locations are subject to change.  
2. Refer Sheets 11 - 14 for details of proposed in-stream features.



- NOTES:
- Proposed in-stream features are not shown on these sections as locations are subject to change. Refer Sheets 11 - 14 for details of proposed in-stream features.

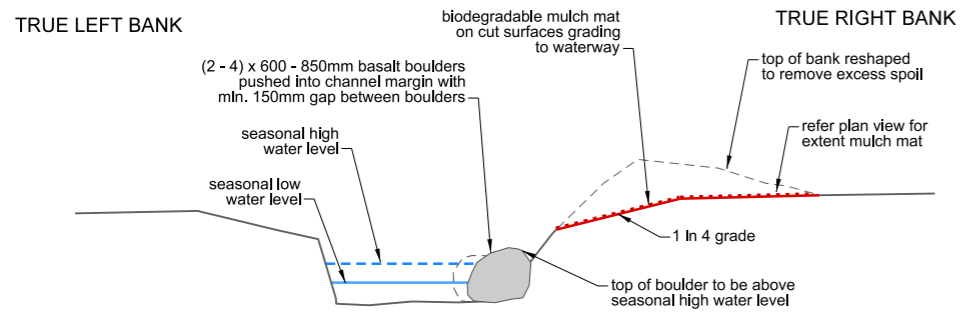


- NOTES:
- Proposed in-stream features are not shown on these section as locations are subject to change.
  - Refer Sheets 11 - 14 for details of proposed in-stream features.

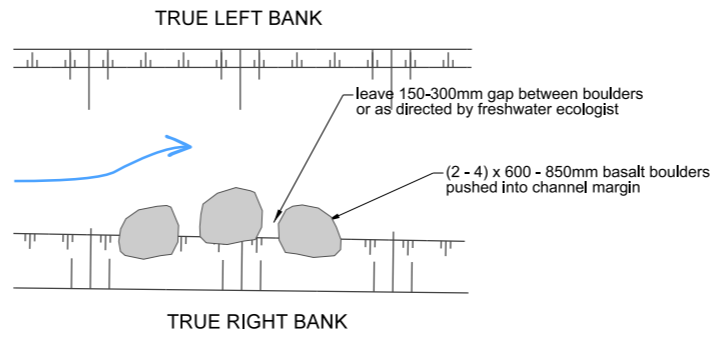




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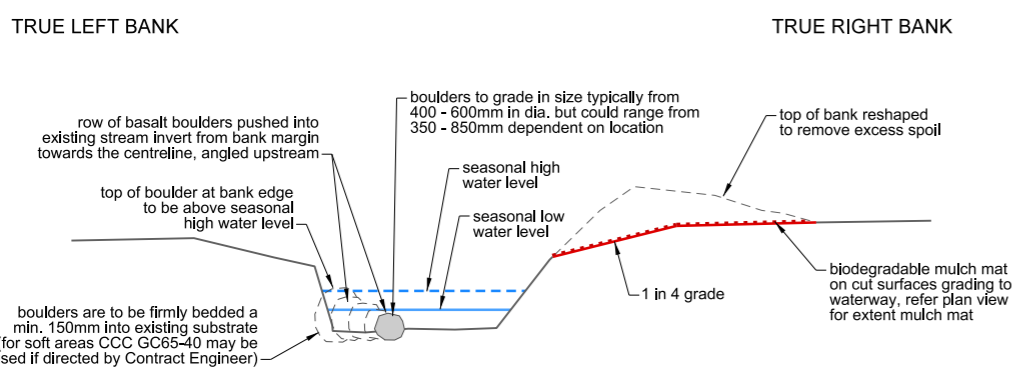
**(A) TYPICAL DETAIL - ROCK EDGE**  
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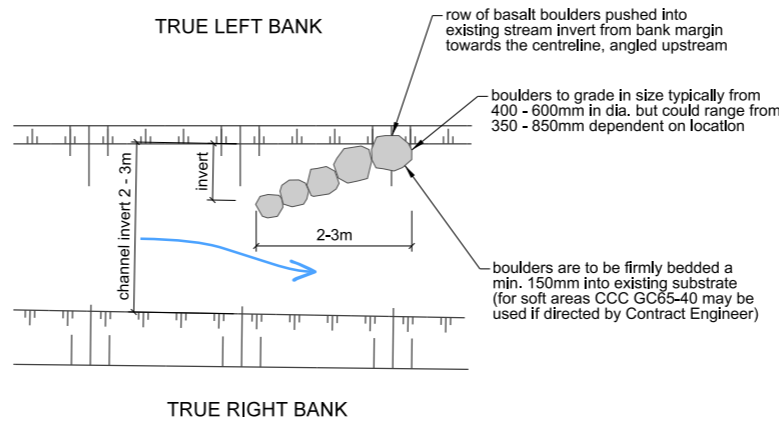
**PLAN VIEW OF ROCK EDGE**

**DETAIL AIM:**  
 - boulders are placed at the invert margin to both narrow the channel and encourage the centreline to meander;  
 - spaces are left between the boulders to provide refuge for smaller aquatic species and access to soft substrate;  
 - emergent boulders provide egg laying sites for insects.

**DETAIL NOTES:**  
 1. Exact number of boulders for each location to be determined on site.  
 2. Location, placement of boulders and the gap between the boulders is to be under the direction of a Freshwater Ecologist.  
 3. Rock Embedment Detail M, Sheet D19 to be used in conjunction with this detail for boulders against banks at the direction of the CCC Contract Engineer.  
 4. Mirror this detail for rock edge on the true left bank.



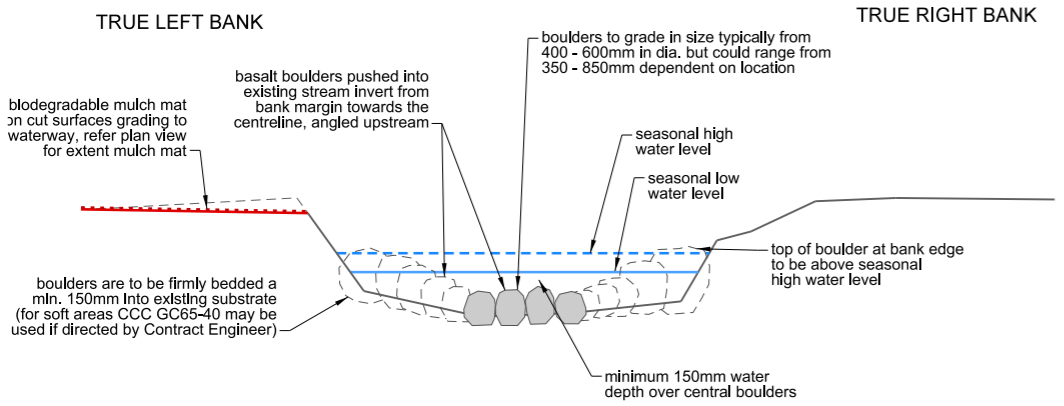
**(B) TYPICAL DETAIL - ROCK VANE**  
SCALE 1:50



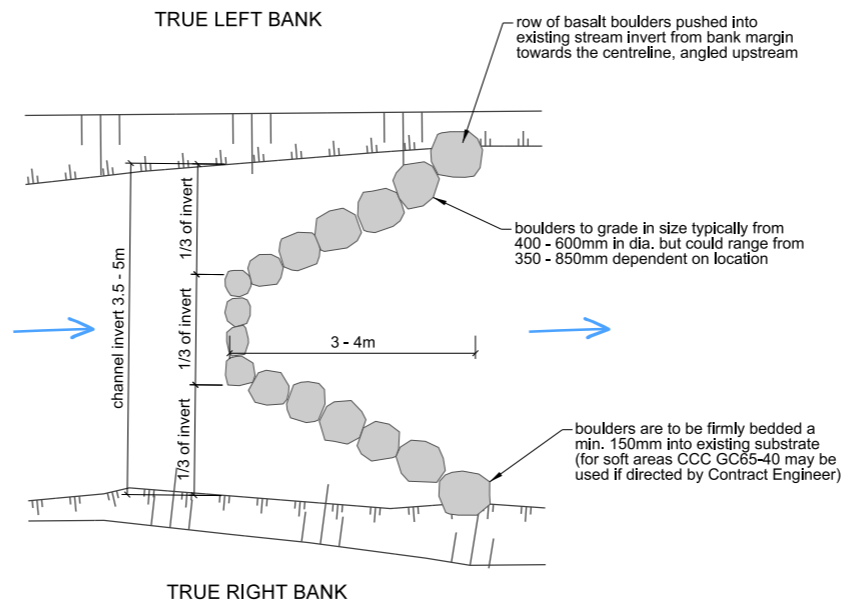
**PLAN VIEW OF ROCK VANE**

**DETAIL AIM:**  
 - boulders are bedded into existing stream substrate to form a mostly submerged, sloping structure that is angled upstream (similar to a log vane);  
 - this vane will create variable water velocity and provide a small back water between the rock vane and bank providing habitat for aquatic species;  
 - boulder/s closest to the bank are emergent providing egg laying sites for insects.

**DETAIL NOTES:**  
 1. Boulders to grade up in size from smallest towards the middle of the invert to largest at the margin.  
 2. Size of boulders used is to be determined on site, subject to the approval of the CCC Contracts Engineer.  
 3. Location, placement and angle of the boulders is to be under the direction of a Freshwater Ecologist.  
 4. CCC GC65-40 is only to be used at the direction of the CCC Contract Engineer.  
 5. Rock Embedment, Detail M, Sheet D19 to be used in conjunction with this detail at the direction of the CCC Contract Engineer.  
 6. Mirror this detail for rock vane on the true right bank.



**(C) TYPICAL DETAIL - ROCK CROSS VANE**  
SCALE 1:50

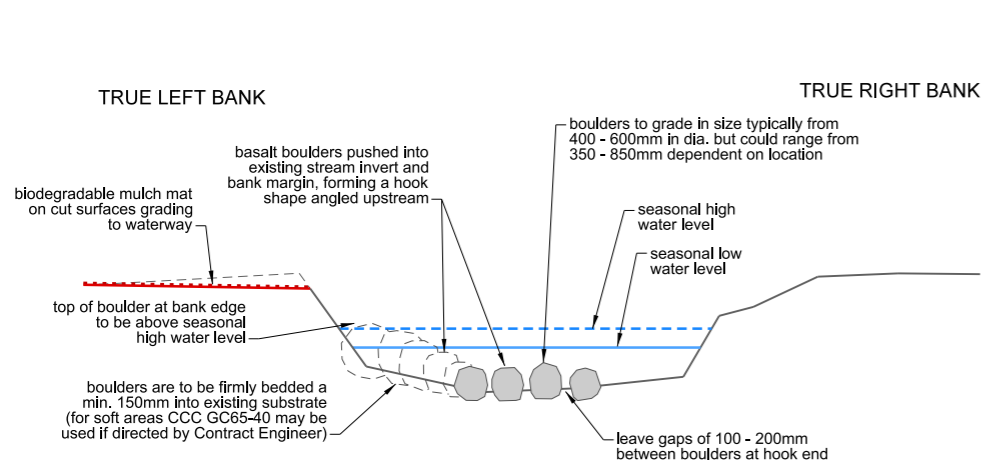


**PLAN VIEW OF ROCK CROSS VANE**

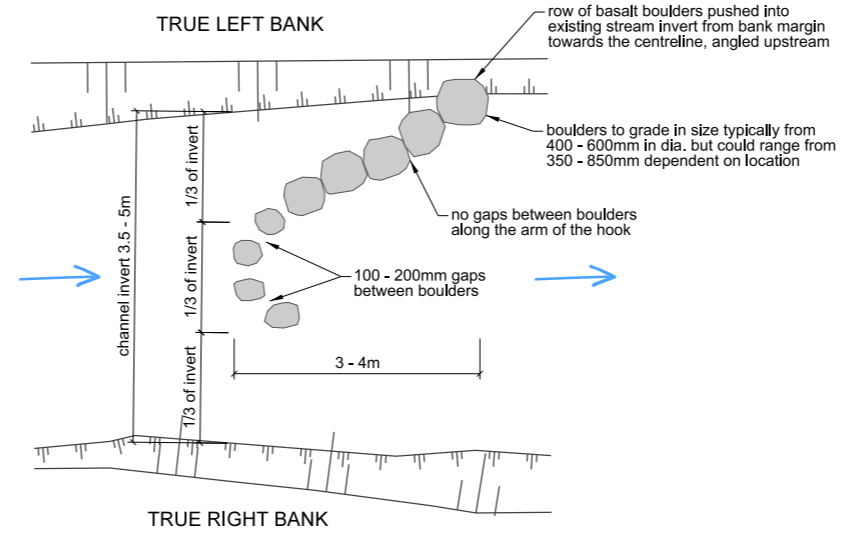
**DETAIL AIM:**  
 - boulders are bedded into the existing stream substrate to form a mostly submerged sloping structure with central shallow weir (weir is completely submerged);  
 - this structure is angled upstream to provide variable water velocity and direct water flow centrally;  
 - small back waters are created at the margins and a deeper pool will form downstream of weir over time providing habitat for aquatic species;  
 - boulders closest to the bank are emergent providing egg laying sites for insects.

**DETAIL NOTES:**  
 1. Boulders to grade up in size from smallest in the middle of the invert to largest at the margins.  
 2. Size of boulders used is to be determined on site, subject to the approval of the CCC Contract Engineer.  
 3. Location and placement of the boulders is to be under the direction of a Freshwater Ecologist.  
 4. CCC GC65-40 is only to be used at the direction of the CCC Contract Engineer.  
 5. Rock Embedment, Detail M, Sheet D19 to be used in conjunction with this detail at the direction of the CCC Contract Engineer.

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**(D) TYPICAL DETAIL - J-HOOK VANE**  
SCALE 1:50

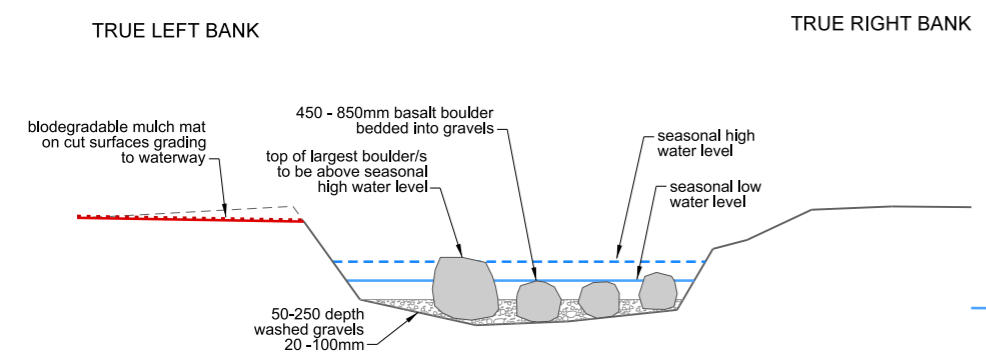


**PLAN VIEW OF J-HOOK VANE**  
SCALE N.T.S.

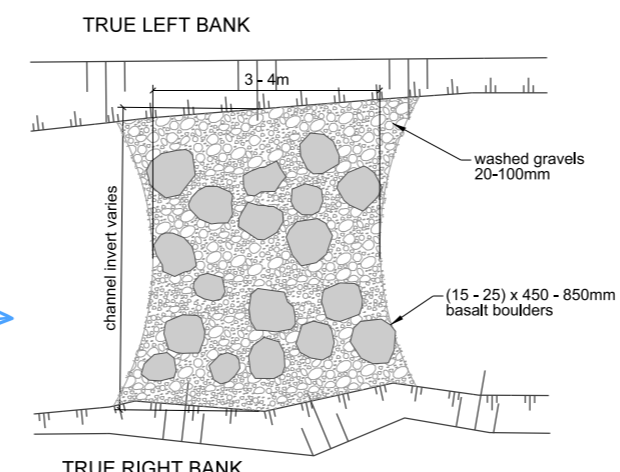
**DETAIL AIM:**  
 - boulders are bedded into the existing stream substrate to form a mostly submerged sloping structure with central semi-circle or hook;  
 - this structure is angled upstream to provide variable water velocity and direct water flow centrally;  
 - a back water is created at the margin and a scour pool will form downstream of hook over time, both providing habitat for aquatic species;  
 - boulder/s closest to the bank are emergent providing egg laying sites for insects.

**DETAIL NOTES:**

1. Boulders to grade up in size from smallest in the middle of the invert to largest at the margins.
2. Location and placement of the boulders is to be under the direction of a Freshwater Ecologist.
3. CCC GC65-40 is only to be used at the direction of the Contracts Engineer.
4. Rock Embedment, Detail M, Sheet D19 to be used in conjunction with this detail at the direction of the CCC Contract Engineer.



**(E) TYPICAL DETAIL - RIFFLE**  
SCALE 1:50

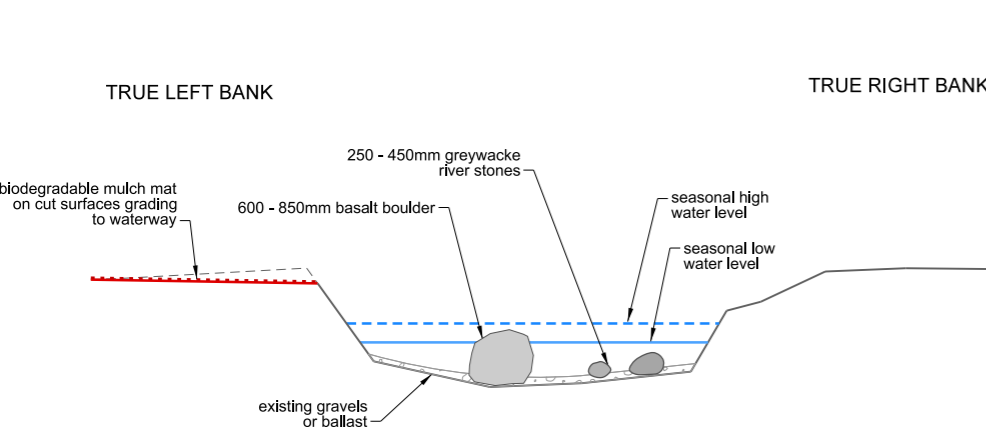


**PLAN VIEW OF RIFFLE**  
SCALE N.T.S.

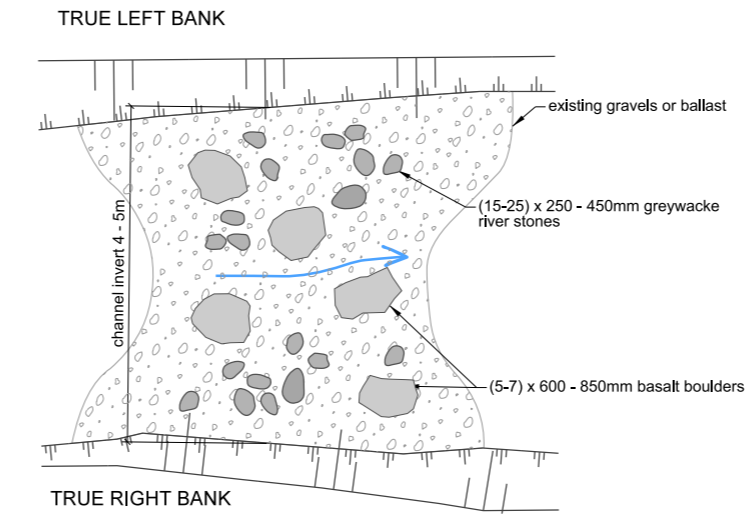
**DETAIL AIM:**  
 - gravels and boulders are placed in the invert to both shallow the depth and change the velocity of the stream flow providing habitat for aquatic species;  
 - the largest basalt boulders are to be emergent to provide egg laying sites for insects.

**DETAIL NOTES:**

1. Boulders and gravels are to be placed under the direction of a Freshwater Ecologist.



**(F) TYPICAL DETAIL - BOULDER AND COBBLE CLUSTERS**  
SCALE 1:50



**PLAN VIEW OF BOULDER AND COBBLE CLUSTERS**  
SCALE N.T.S.

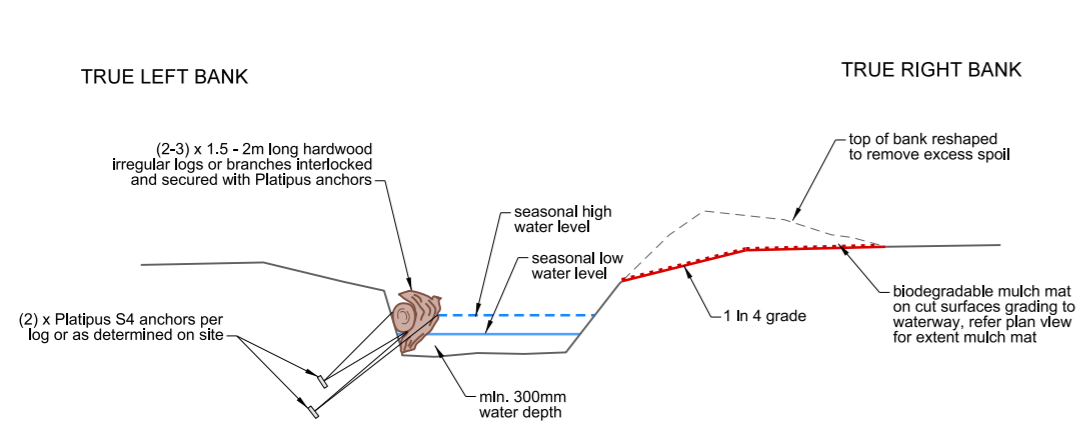
**DETAIL AIM:**  
 - a mix of angular boulders and rounded river stones (in a range of sizes) are bedded into existing gravels or ballast to provide riffle-like conditions, providing habitat for aquatic species;  
 - the largest basalt boulders will be emergent providing egg laying site for insects.

**DETAIL NOTES:**

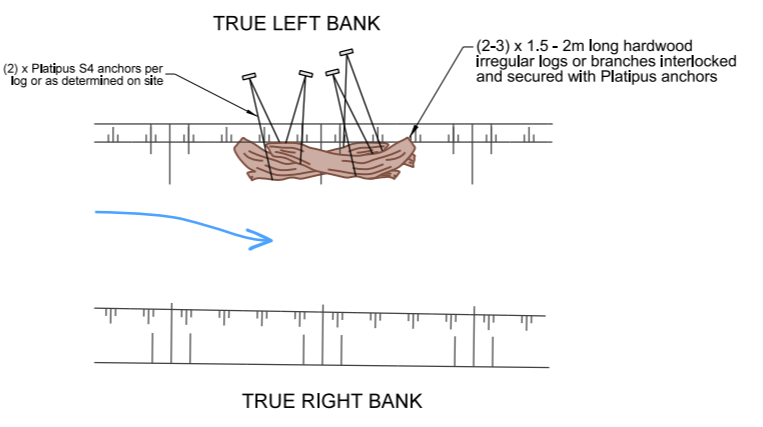
1. Boulders and river stones are to be clustered under the direction of a Freshwater Ecologist.



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**G** TYPICAL DETAIL - TIMBER EDGE  
SCALE 1:50

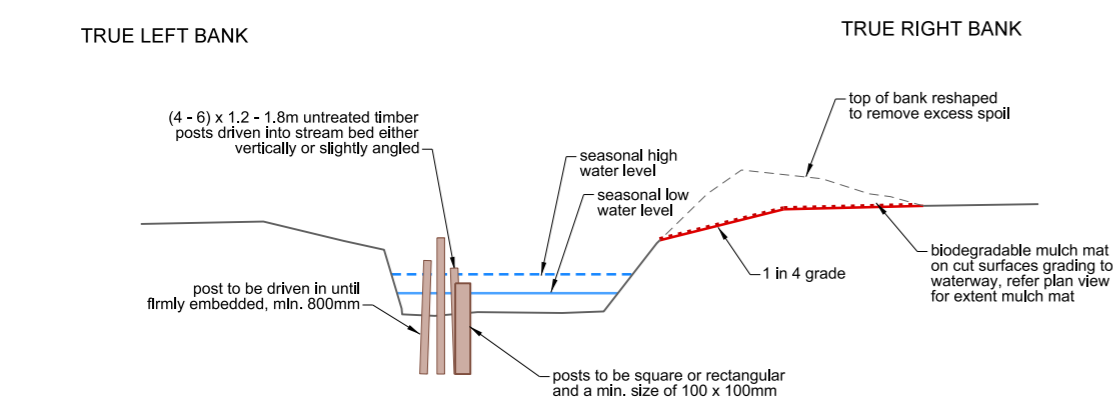


PLAN VIEW OF TIMBER EDGE

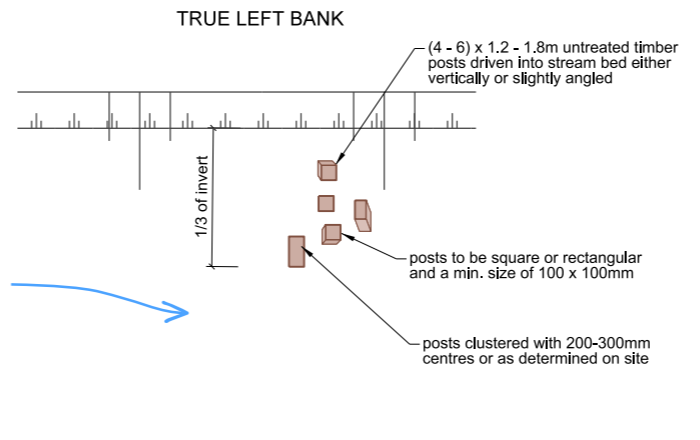
**DETAIL AIM:**  
- weathered hardwood timber (branches or irregular logs) are secured to bank to form an overhang and fish refuge;  
- timber is to be interlocked to secure and provide spaces for refuge and access to soft substrate of the bank.

**DETAIL NOTES:**

1. The Platipus anchors are to be installed so that there is no slack in the stainless steel wire around the timber.
2. Location, placement of timber is to be under the direction of a Freshwater Ecologist to ensure site specific outcome achieved.
3. Mirror this detail for rock edge on the true right bank.



**H** TYPICAL DETAIL - POST SNAG  
SCALE 1:50

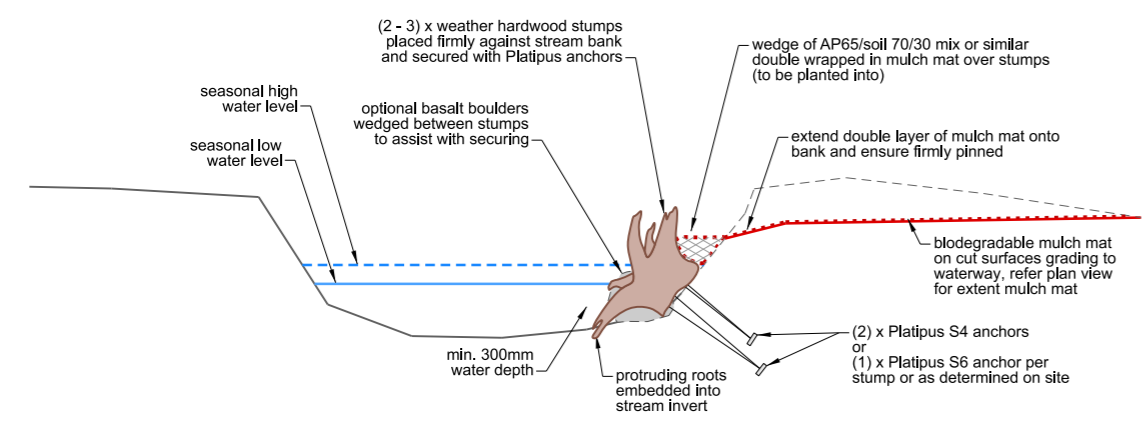


PLAN VIEW OF POST SNAG  
SCALE 1:25

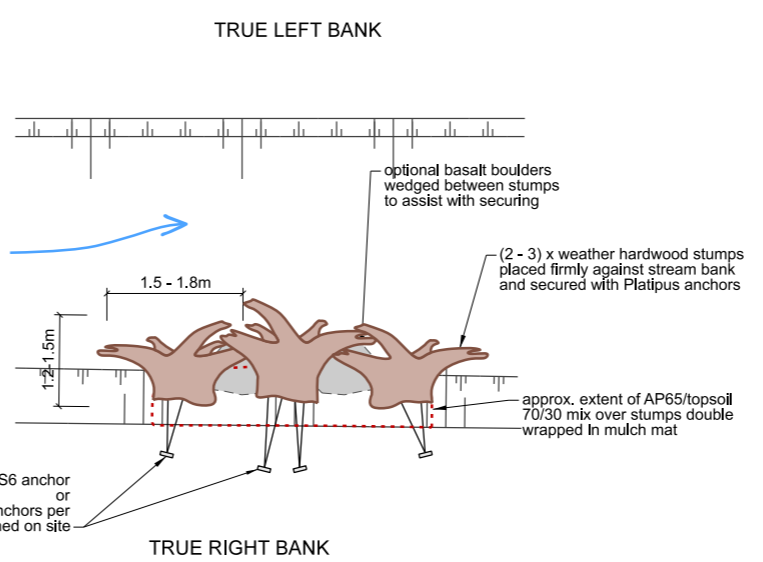
**DETAIL AIM:**  
- untreated timber posts are driven into the streambed in a cluster to trap fine woody debris entering the waterway;  
- the woody debris snag provides variable stream velocity and habitat for aquatic species.

**DETAIL NOTES:**

1. Timber posts used can vary in size and type of timber but must be untreated timber which can include rough sawn pine, reclaimed hardwood posts from on site or other hardwood posts.
2. Posts are to be driven into the streambed a minimum of 1/3 of the post or until they firmly embedded in stream invert.
3. Positioning of posts shown is indicative, exact placement and distance between posts is to be under the direction of a Freshwater Ecologist.
4. Mirror this detail for post snag on the true right bank.



**I** TYPICAL DETAIL - ROOT WAD EDGE  
SCALE 1:50



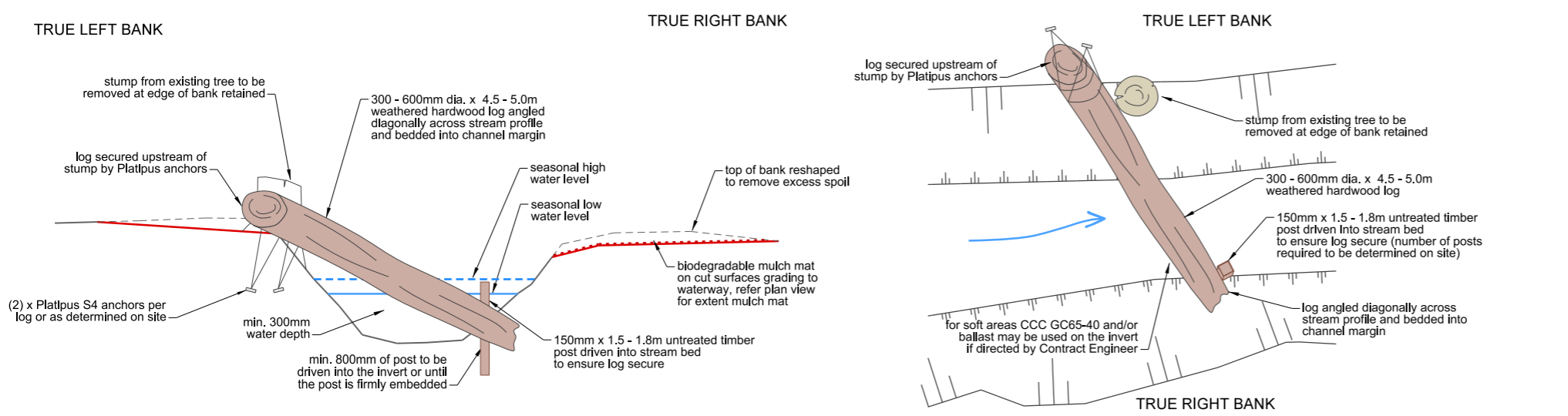
PLAN VIEW OF ROOT WAD EDGE

**DETAIL AIM:**  
- a fish refuge is created by the tangled roots of weathered tree stumps firmly secured to the side of the bank;  
- the root wad edge provides variable stream velocity and habitat for aquatic species.

**DETAIL NOTES:**

1. The Platipus anchors are to be installed so that there is no slack in the stainless steel wire around the timber.
2. The weathered stumps are to be hardwood or a mix of hardwood and softwood species (e.g. pine).
3. Location and placement of the stumps is to be under the direction of a Freshwater Ecologist to ensure site specific outcome achieved.
4. Mirror this detail for root wad edge on the true left bank.

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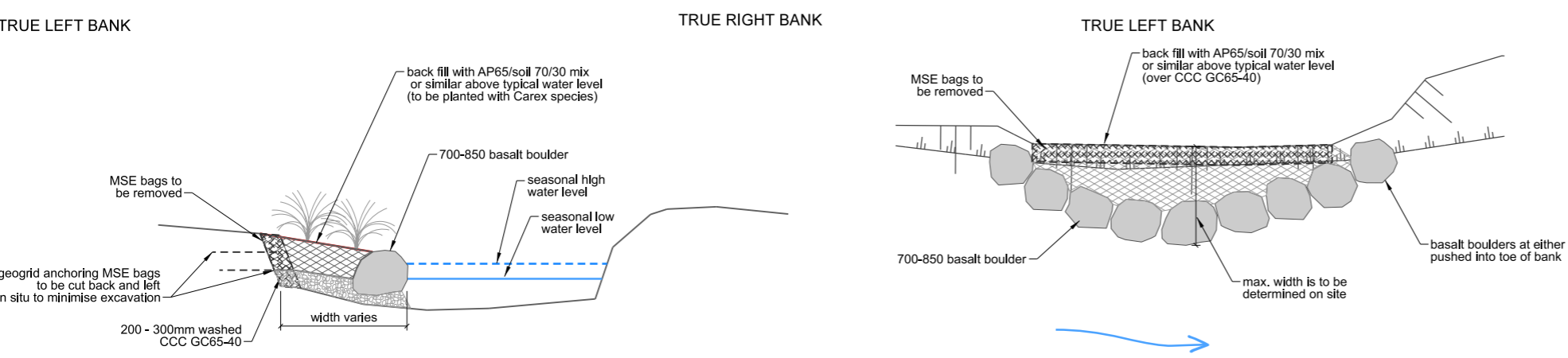
**DETAIL AIM:**  
 - a hardwood log is wedged across the stream profile providing an informal weir and fish refuge;  
 - the root wad edge provides variable stream velocity and habitat for aquatic species.

**DETAIL NOTES:**

1. The Platipus anchors are to be installed so that there is no slack in the stainless steel wire around the timber.
2. Number of hardwood posts required to secure log at margin is to be determined on site, subject to approval of CCC Contract Engineer.
3. Location and placement of the log is to be under the direction of a Freshwater Ecologist to ensure site specific outcome achieved.
4. Rock Embedment, Detail M where the log is substituted for the boulder, is to be used in conjunction with this detail at the direction of the CCC Contract Engineer.
5. Rock armouring, a continuous row of rock as per Rock Embedment, Detail M, to be used in conjunction with this detail at the direction of the CCC Contract Engineer.

**J** TYPICAL DETAIL - LOG SNAG  
 SCALE 1:50

**PLAN VIEW OF LOG SNAG**  
 SCALE N.T.S.



**DETAIL AIM:**  
 - replace section of waterway lined with MSE bags with rock retaining to remove or minimise plastic within the waterway

**DETAIL NOTES:**

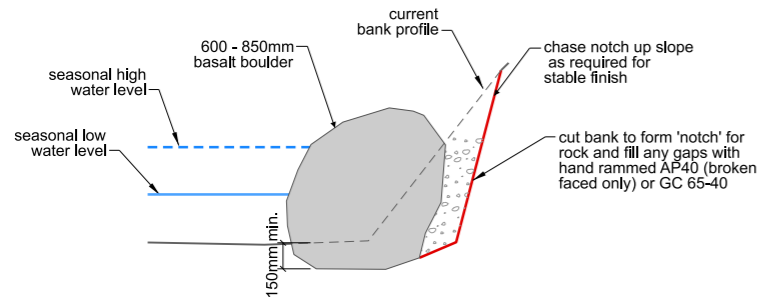
1. All layers of MSE bags are to be removed unless ground conditions limit the removal of bottom layer.
2. The bottom or lower layers are only to be left if directed by the CCC Contract Engineer.
3. The distance the rock is to extend into the waterway channel is to be determined on site, subject to approval of the CCC Contract Engineer.

**K** TYPICAL DETAIL - ROCK RETAINING EDGE  
 SCALE 1:50

**PLAN VIEW OF ROCK RETAINING EDGE**

**L** TYPICAL PLANTING CROSS SECTION  
 SCALE 1:50

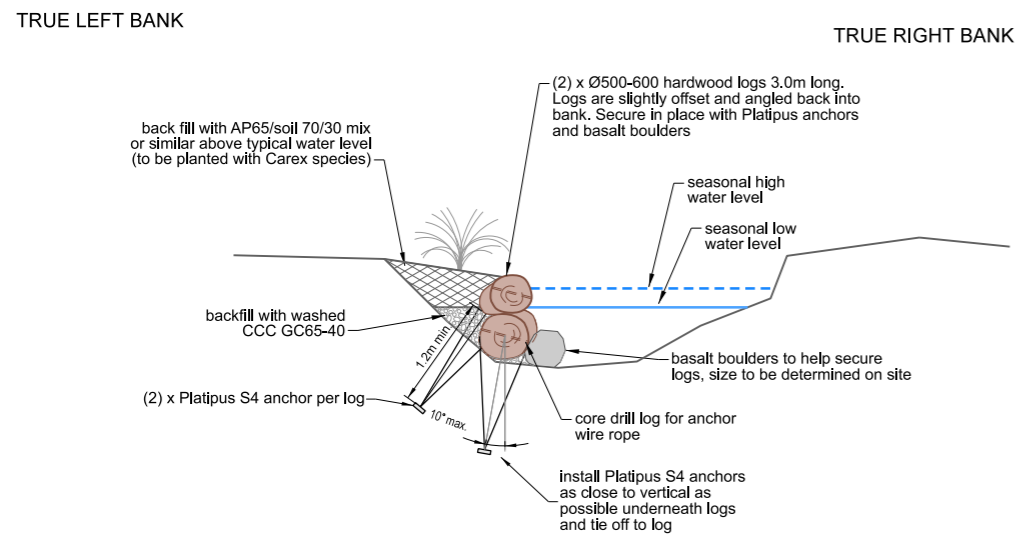
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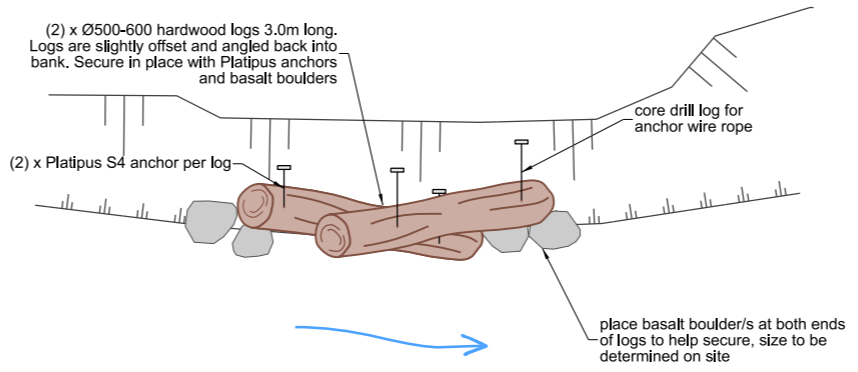
**(M) TYPICAL DETAIL - ROCK EMBEDMENT**  
SCALE 1:20

**DETAIL AIM:**  
- to provide scour protection at interface between rock and bank at the bank margin.

**DETAIL NOTES:**  
1. This detail is to be used in conjunction with any detail utilising rock at the bank margin if directed by the CCC Contract Engineer.



**(N) TYPICAL DETAIL - LOG EDGE**  
SCALE 1:50



**PLAN VIEW OF LOG EDGE**

**DETAIL AIM:**  
- weathered hardwood log or logs is/are secured to the channel and bank margin to form a stable edge;  
- where two logs are used angled back, an overhang and spaces for refuge are created.

**DETAIL NOTES:**  
1. A single larger diameter hardwood log can be substituted for the two logs indicated. Use of a single log and the size of the Platipus Anchors required are subject to approval of the CCC Contract Engineer.  
2. The Platipus anchors are to be installed so that there is no slack in the stainless steel wire around the timber.  
3. Location, placement of timber is to be under the direction of a Freshwater Ecologist to ensure site specific outcome achieved.  
4. The distance the log edge is to extend into the waterway channel is to be determined on site, subject to approval of the CCC Contract Engineer.