APPENDIX A –REACH DECRIPTIONS

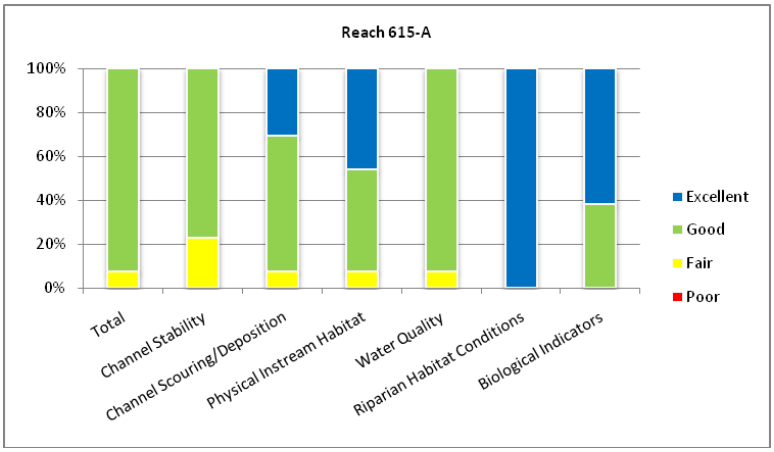
Basin 615, South Fork of Quantico Creek - Project Reach Descriptions

Reach Name: 615-A

Coordinates (NAD 83, Virginia State Plane North):
11796510.57, 6893938.95 to 11801555.79, 6894362.86

Average RSAT Score: 36

General Description:

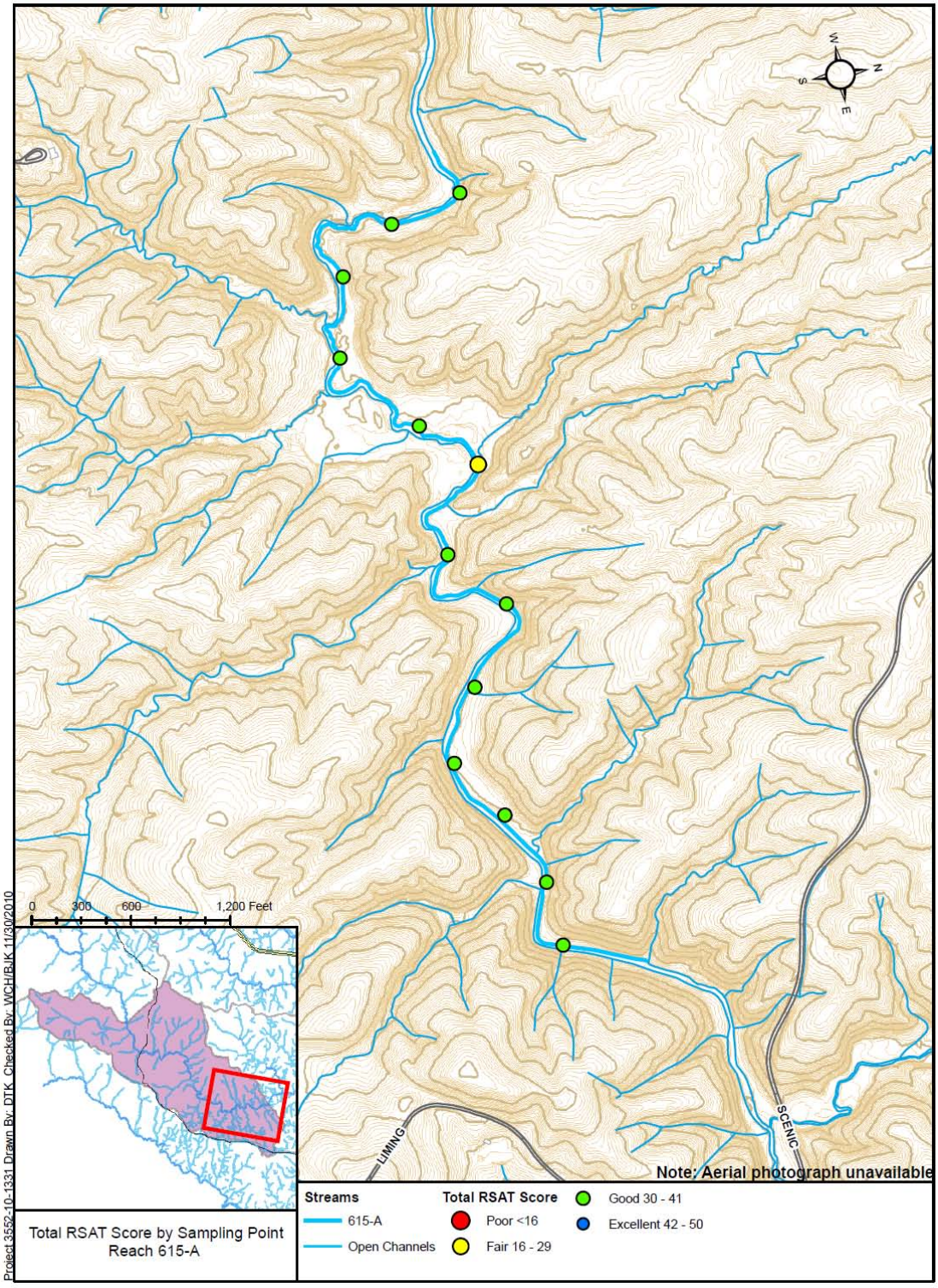


Reach 615-A begins at a marked transition in channel morphology, from the steeply-sloped, bedrock and boulder dominated reaches located immediately upstream, to a gently meandering channel composed of predominantly gravel and cobble substrate. An average score of 6 points (based on thirteen sample locations) for channel stability, scouring/deposition, and physical in-stream habitat indicate a good quality stream that is geomorphically stable. Approximately 80% of streambanks are stable, with only minor bank scouring, occurring opposite of gravel point bars. Approximately 25-49% of bed material is embedded gravel and cobble, with well-formed pools and riffles, and depositional point bars comprised of coarse gravel with minimal sand deposits.

Riparian habitat is in excellent condition along this reach, with a wide forested buffer in excess of 200ft on either side of the channel. Canopy cover is dense, providing greater than 80% shading over the stream. In addition, the biological indicator scores are excellent, corresponding to the rich diversity and large quantities of macroinvertebrates, including mayflies, stoneflies, and caddisflies. Water quality along Reach 615-A is good, with an average score of 5, indicative of light substrate fouling, low TDS, and visibility to depths greater than 1.5ft, despite large amounts of leaf litter and organic debris from the surrounding riparian forest.

Problem Areas:
None

Recommendations:
None


W
N
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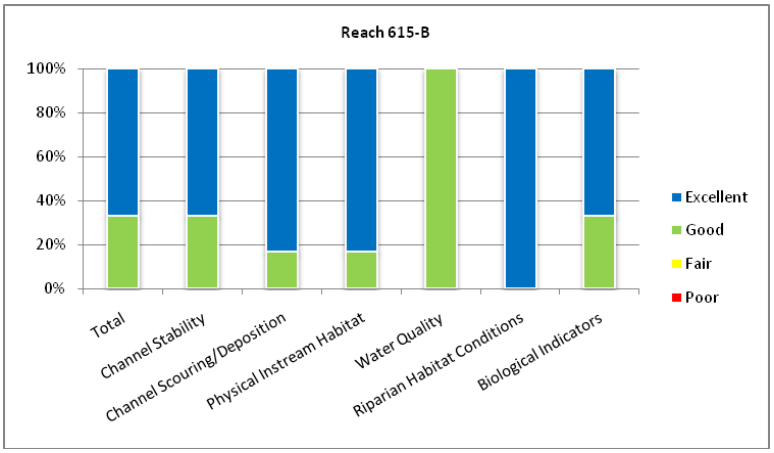
0
300
600
1,200 Feet
LIMING
SCENIC
Note: Aerial photograph unavailable
Streams
615-A
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50
Total RSAT Score by Sampling Point
Reach 615-A
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010

Reach Name: 615-B

Coordinates (NAD 83, Virginia State Plane North):
11794355.82, 6895260.88 to 11796526.65, 6893906.28

Average RSAT Score: 43

General Description:

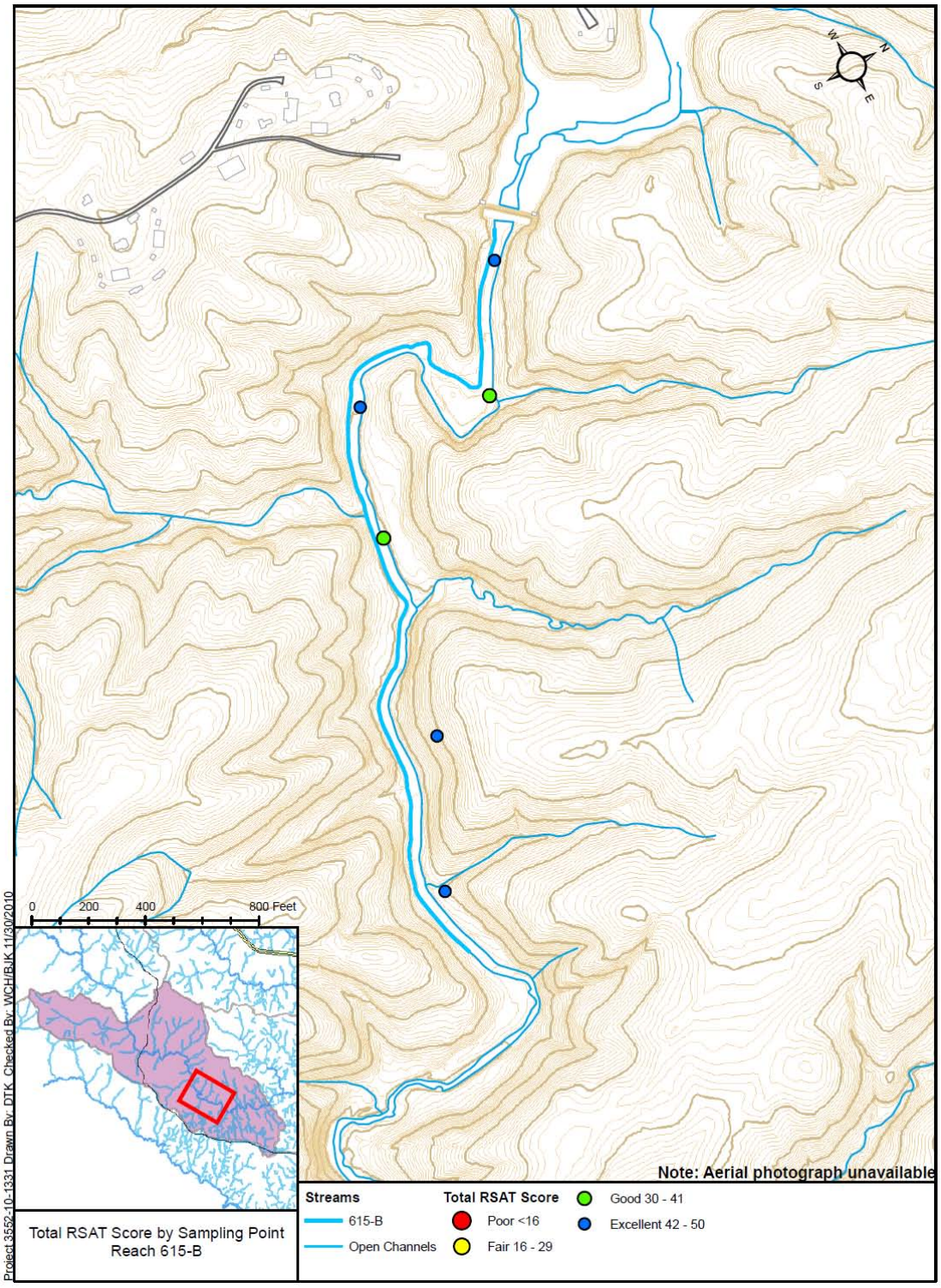


Reach 615-B received the highest RSAT scoring of all the reaches included in the Quantico Creek Watershed Assessment, with an average total score of 43. Reach 615-B is characterized by stable, well-vegetated streambanks, a lack of bank sloughing or erosion, and highly resistant bed and bank materials, giving the reach an excellent channel stability rating. In addition, the boulder and cobble dominated stream provides a varied depth and velocity regime, few depositional features, low embeddedness of riffle material, and deep pools (providing refugia for fish and other aquatic organisms); all features that are representative of excellent scouring/deposition and physical instream habitat scores.

Riparian habitat remains in excellent condition, with a wide forested buffer in excess of 200ft on either side of the channel. Canopy cover is dense, providing greater than 80% shading over the stream. In addition, the biological indicator scores are excellent, corresponding to the rich diversity and large quantities of macroinvertebrates. Water quality along Reach 615-A is good, with an average score of 5, indicative of light substrate fouling, low TDS, and visibility to depths greater than 1.5ft, despite large amounts of leaf litter and organic debris from the surrounding riparian forest.

Problem Areas:
None

Recommendations:
None

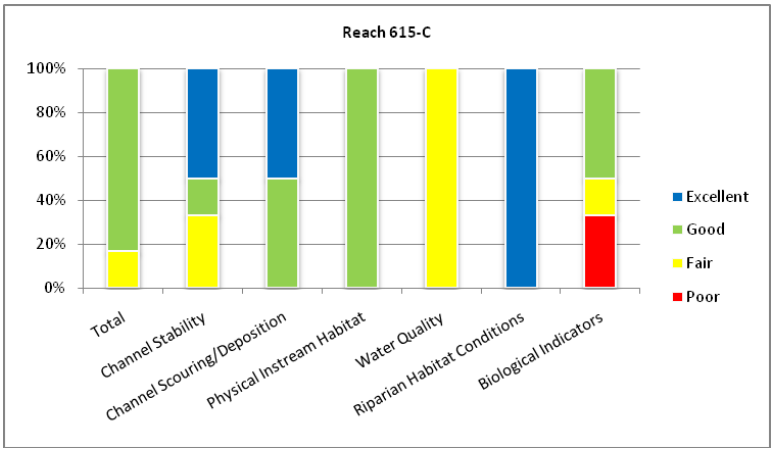

0
200
400
800 Feet
Note: Aerial photograph unavailable
Streams
615-B
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50
Total RSAT Score by Sampling Point
Reach 615-B
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010

Reach Name: 615-C

Coordinates (NAD 83, Virginia State Plane North):
11791799.93, 6898578.29 to 11793920.34, 6896446.55

Average RSAT Score: 33

General Description:

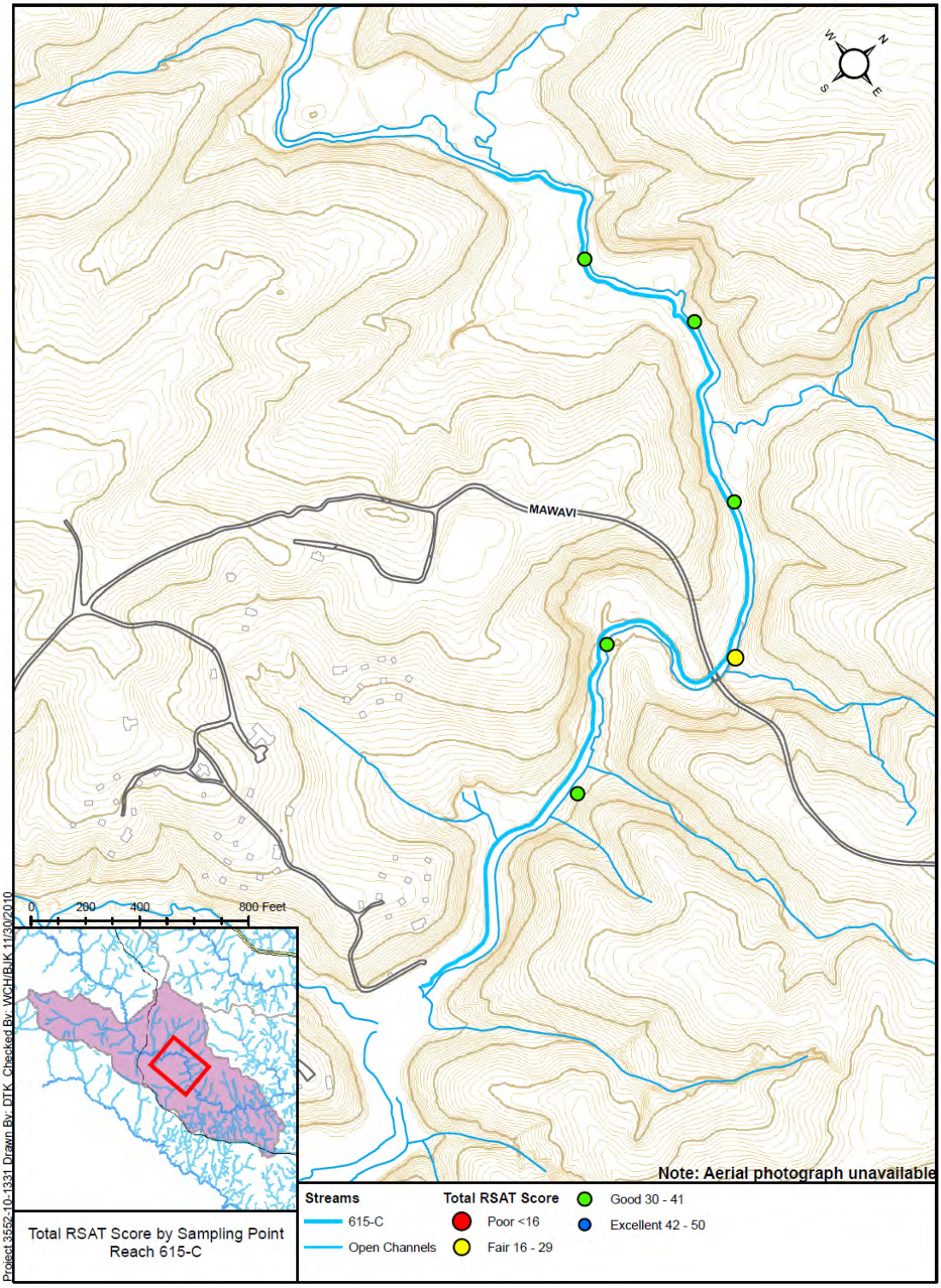


Reach 615-C received an average total RSAT score of 33, indicating a good quality stream that is geomorphically stable. Overall, Reach 615-C has excellent channel stability, with approximately 80% of the streambanks stable, a general lack of bank sloughing or erosion, and highly resistant bed and bank materials. Channel scouring/ deposition scores were good, with only 25-49% of the gravel and cobble bed material embedded, well-formed pools and riffles, and depositional point bars comprised of coarse gravel with minimal sand deposits. Physical instream habitat was also good, with a varied velocity and depth regime, and a mix of riffles, runs, and pools.

Riparian habitat remains in excellent condition, with a wide forested buffer in excess of 200ft on either side of the channel. Canopy cover is dense, providing greater than 80% shading over the stream. However, biological indicator and water quality ranked fair, corresponding to a reduced diversity and quantity of macroinvertebrates, coupled with an increase in substrate fouling, TDS, and reduced depth of visibility.

Problem Areas:
None

Recommendations:
None

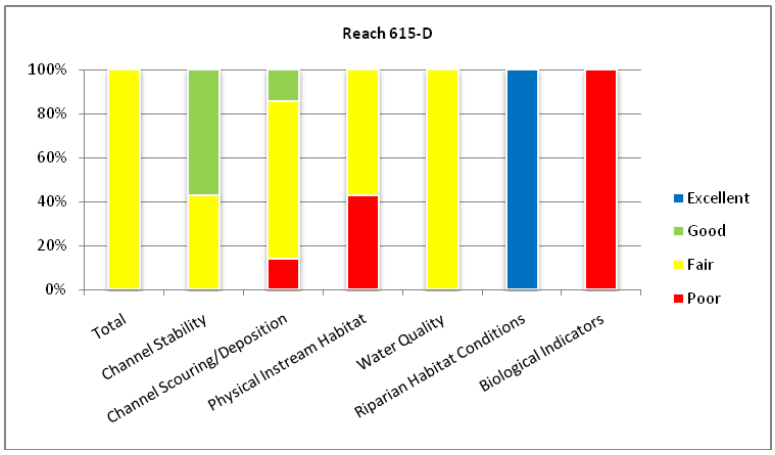

MAWAVI
0 200 400 800 Feet
Note: Aerial photograph unavailable
Streams
615-C
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50
Total RSAT Score by Sampling Point
Reach 615-C
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010

Reach Name: 615-D

Coordinates (NAD 83, Virginia State Plane North):
11798049.23, 6896340.29 to 11798623.20, 6893642.92

Average RSAT Score: 23

General Description:

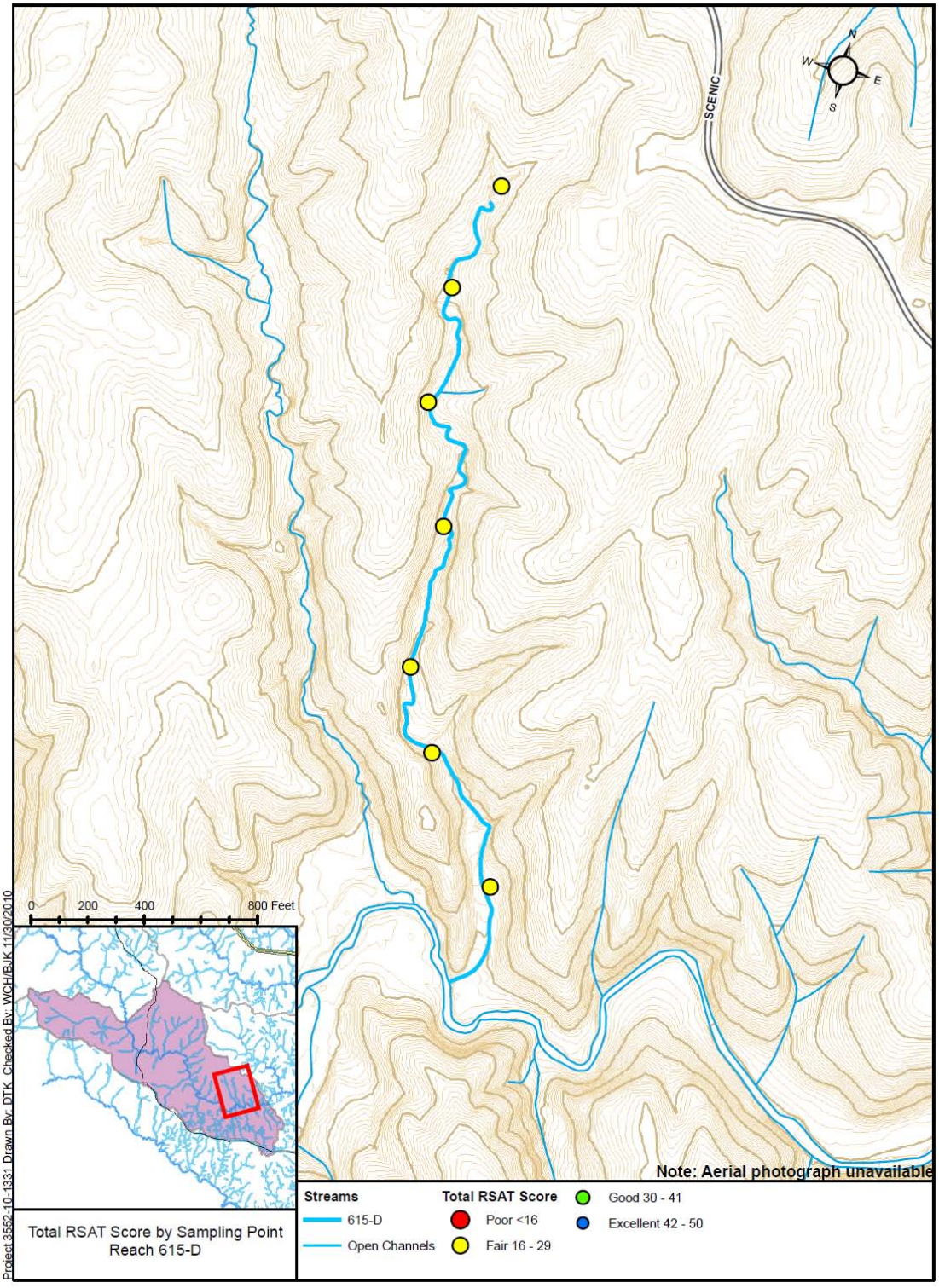


Reach 615-D is a fair quality stream, with an average total RSAT score of 23. In general, Reach 615-D has good channel stability, with 71-80% of the streambanks stable, relatively little bank sloughing or erosion, and resistant bed and bank materials. Channel scouring/deposition and physical instream habitat scores were fair, with increased embeddedness of riffle material, few deep pools and a shallow riffle and run dominated morphology.

Riparian habitat is in excellent condition, with a wide forested buffer in excess of 200ft on either side of the channel, and canopy cover is dense, providing greater than 80% shading. Biological indicators are absent along this reach (resulting in a score of 0), as the flow is shallow and intermittent. Water quality is fair, with a moderate level of substrate fouling (21-50%), increased TDS, and reduced depth of visibility.

Problem Areas:
None

Recommendations:
None


SCENIC
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200
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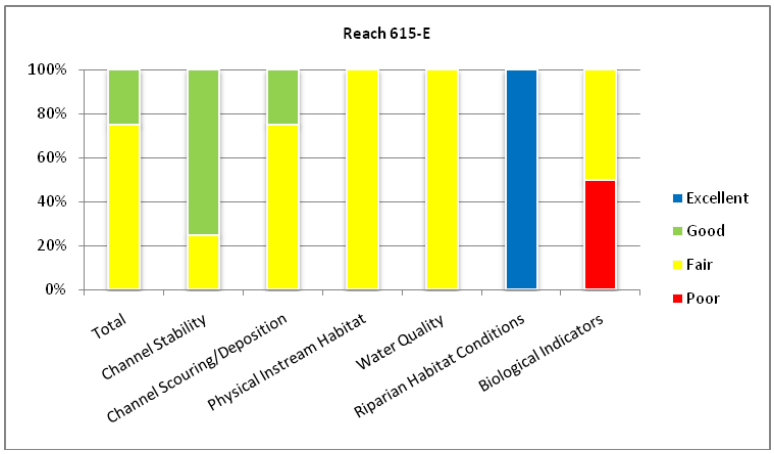
800 Feet
Project 3552_10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Total RSAT Score by Sampling Point
Reach 615-D
Note: Aerial photograph unavailable
Streams
615-D
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50

Reach Name: 615-E

Coordinates (NAD 83, Virginia State Plane North):
11797392.95, 6895791.04 to 11798434.56, 6893876.46

Average RSAT Score: 28

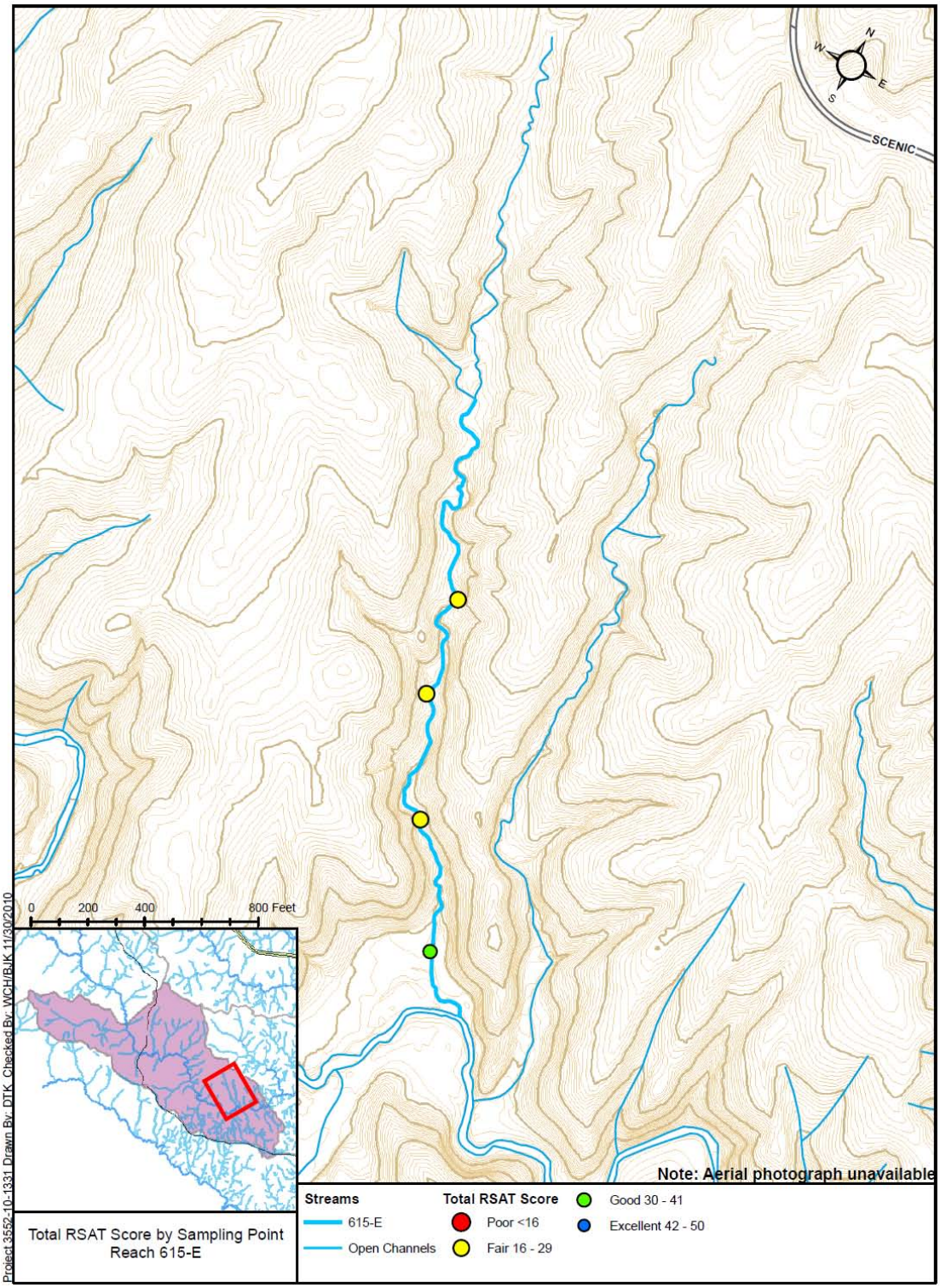
General Description:
Reach 615-E is a fair quality stream, with an average total RSAT score of 28. Reach 615-E has good channel stability, with 71-80% of the streambanks stable, relatively little bank sloughing or erosion, and resistant bed and bank materials. Channel scouring/deposition and physical instream habitat scores were fair, with increased embeddedness of riffle material, few deep pools and a shallow riffle and run dominated morphology.



Riparian habitat is in excellent condition, with a wide forested buffer in excess of 200ft on either side of the channel, and canopy cover is dense, providing greater than 80% shading. Biological indicators are poor, with a nearly depauperate population of midgeflies and snails. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and reduced depth of visibility.

Problem Areas:
None

Recommendations:
None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SCENIC
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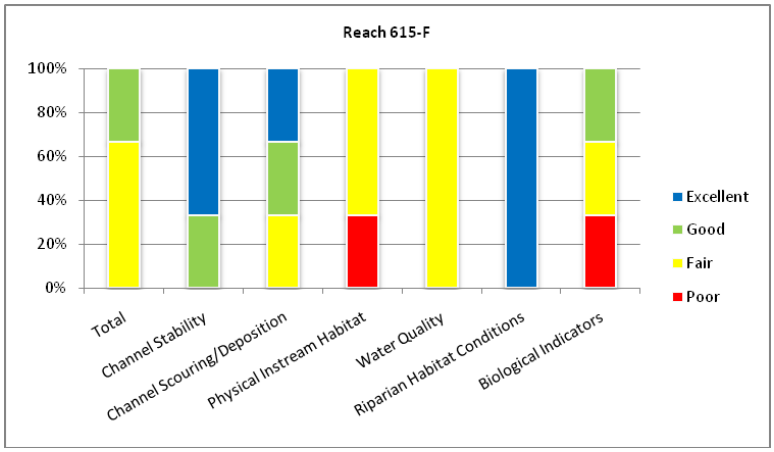
800 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Total RSAT Score by Sampling Point
Reach 615-E
Note: Aerial photograph unavailable
Streams
615-E
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50

Reach Name: 615-F

Coordinates (NAD 83, Virginia State Plane North):
11795168.73, 6899089.19 to 11793748.34, 6898045.50

Average RSAT Score: 30

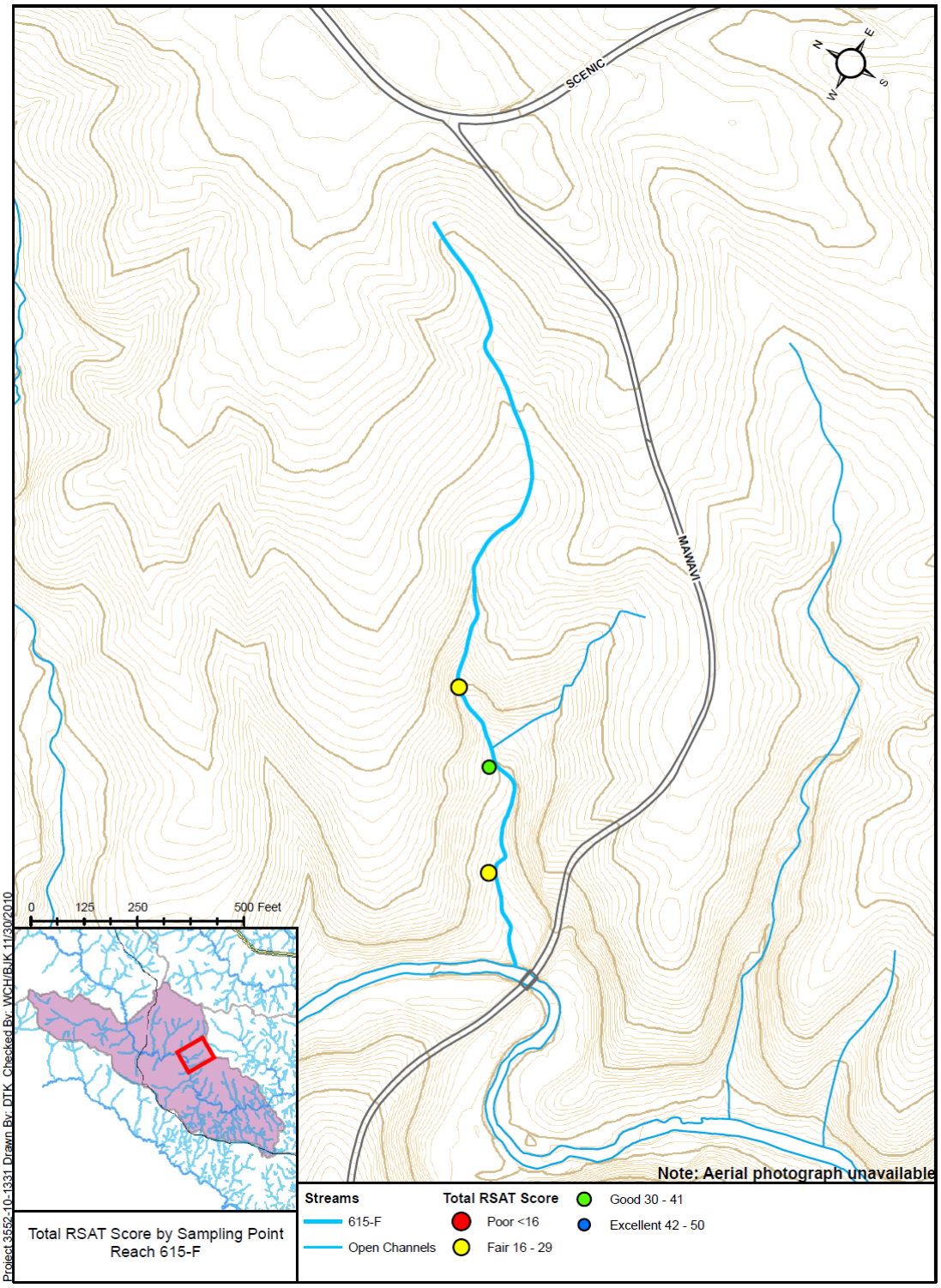
General Description:
Reach 615-F is a good quality stream, with an average total RSAT score of 30. Reach 615-F has good channel stability and scouring/deposition scores, due to stable streambanks, very little bank sloughing or erosion, and resistant bed and bank materials. Physical instream habitat scores were fair, with increased embeddedness of riffle material, few deep pools and a shallow riffle and run dominated morphology.



Riparian habitat is in excellent condition, with a wide forested buffer in excess of 200ft on either side of the channel, and canopy cover is dense, providing greater than 80% shading. Biological indicators are fair, with a few pollution-tolerant species, such as caddisfly and midgefly. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and reduced depth of visibility.

Problem Areas:
None

Recommendations:
None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MAWAVI
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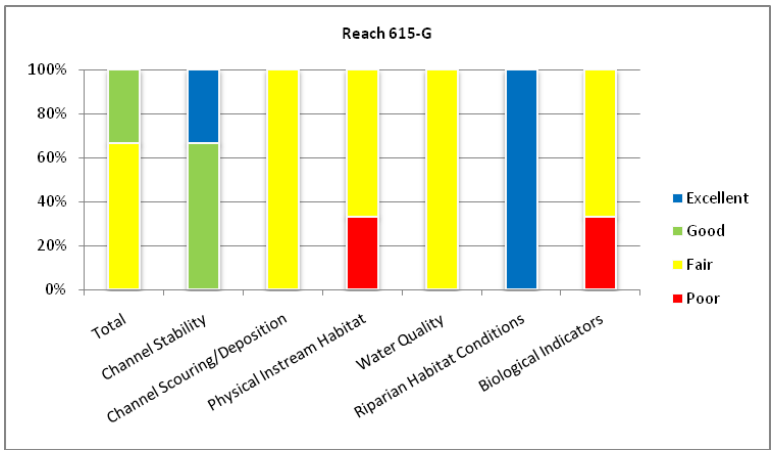
250
500 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Total RSAT Score by Sampling Point
Reach 615-F
Note: Aerial photograph unavailable
Streams
615-F
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50

Reach Name: 615-G

Coordinates (NAD 83, Virginia State Plane North):
11793908.09, 6899652.73 to 11793016.43, 6898599.42

Average RSAT Score: 28

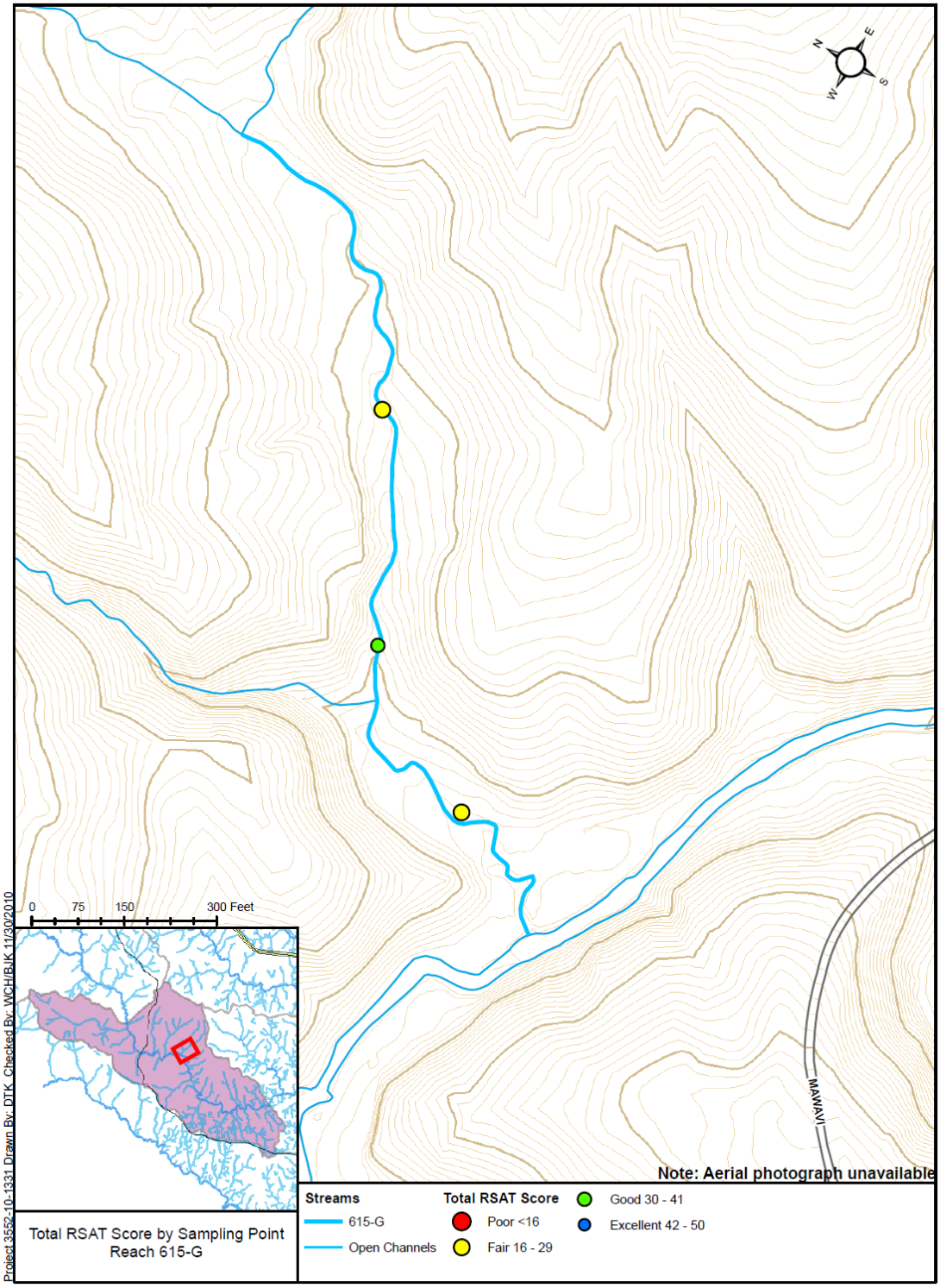
General Description:
Reach 615-G is a fair quality stream, with an average total RSAT score of 28. Reach 615-G has good channel stability, with stable streambanks, little bank sloughing or erosion, and resistant bed and bank materials. Channel scouring/deposition and physical instream habitat scores were fair, with increased embeddedness of riffle material, few deep pools and a shallow riffle and run dominated morphology.



Riparian habitat is in excellent condition, with a wide forested buffer in excess of 200ft on either side of the channel, and canopy cover is dense, providing greater than 80% shading. Biological indicators are fair, with a few pollution-tolerant species, such as caddisfly and midgefly. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and reduced depth of visibility.

Problem Areas:
None

Recommendations:
None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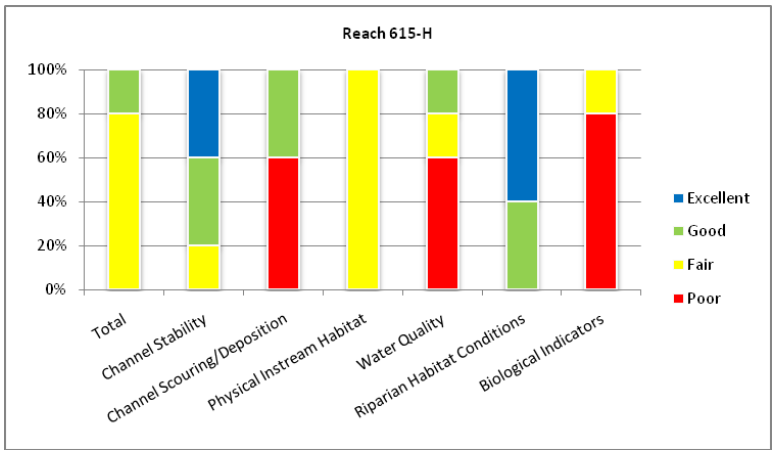
300 Feet
MAWAVI
Note: Aerial photograph unavailable
Streams
615-G
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50
Total RSAT Score by Sampling Point
Reach 615-G
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010

Reach Name: 615-H

Coordinates (NAD 83, Virginia State Plane North):
11792270.85, 6902039.93 to 11791795.57, 6898597.80

Average RSAT Score: 25

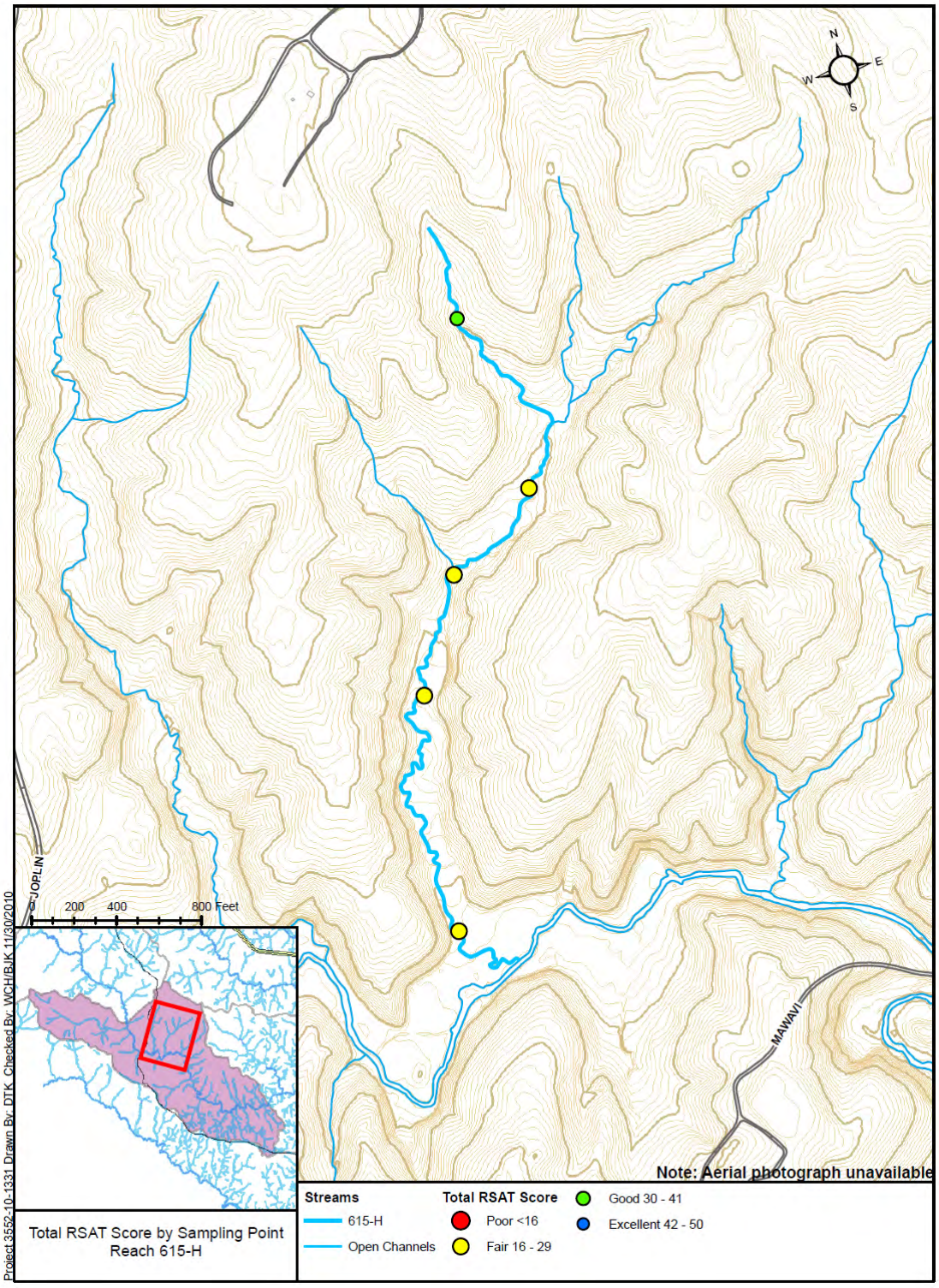
General Description:
Reach 615-H is a fair quality stream, with an average total RSAT score of 25. Reach 615-H has good channel stability, with 71-80% of the streambanks stable, relatively little bank sloughing or erosion, and resistant bed and bank materials. Channel scouring/deposition and physical instream habitat scores were fair, with increased embeddness of riffle material, few deep pools and a shallow riffle and run dominated morphology.



Riparian habitat is in excellent condition, with a wide forested buffer in excess of 200ft on either side of the channel, and canopy cover is dense, providing greater than 80% shading. Biological indicators are poor, with a depauperate population of midgeflies. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and reduced depth of visibility.

Problem Areas:
None

Recommendations:
None


N
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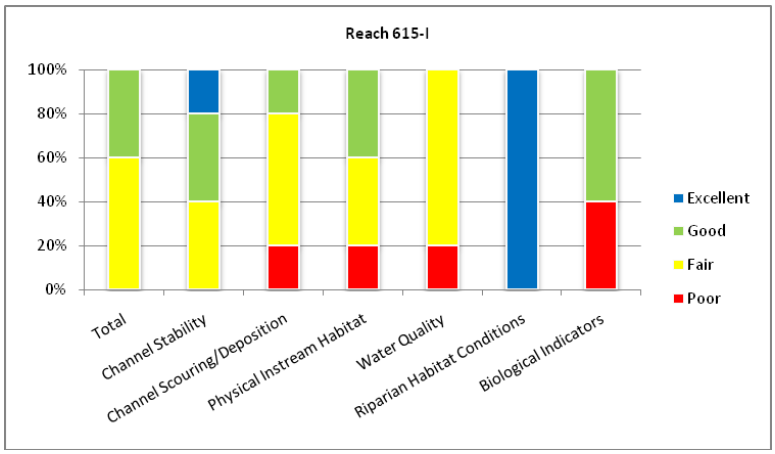
MAWAVI
Note: Aerial photograph unavailable
Streams
615-H
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50
Total RSAT Score by Sampling Point
Reach 615-H
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010

Reach Name: 615-I

Coordinates (NAD 83, Virginia State Plane North):
11790416.93, 6901606.33 to 11790910.20, 6898825.35

Average RSAT Score: 28

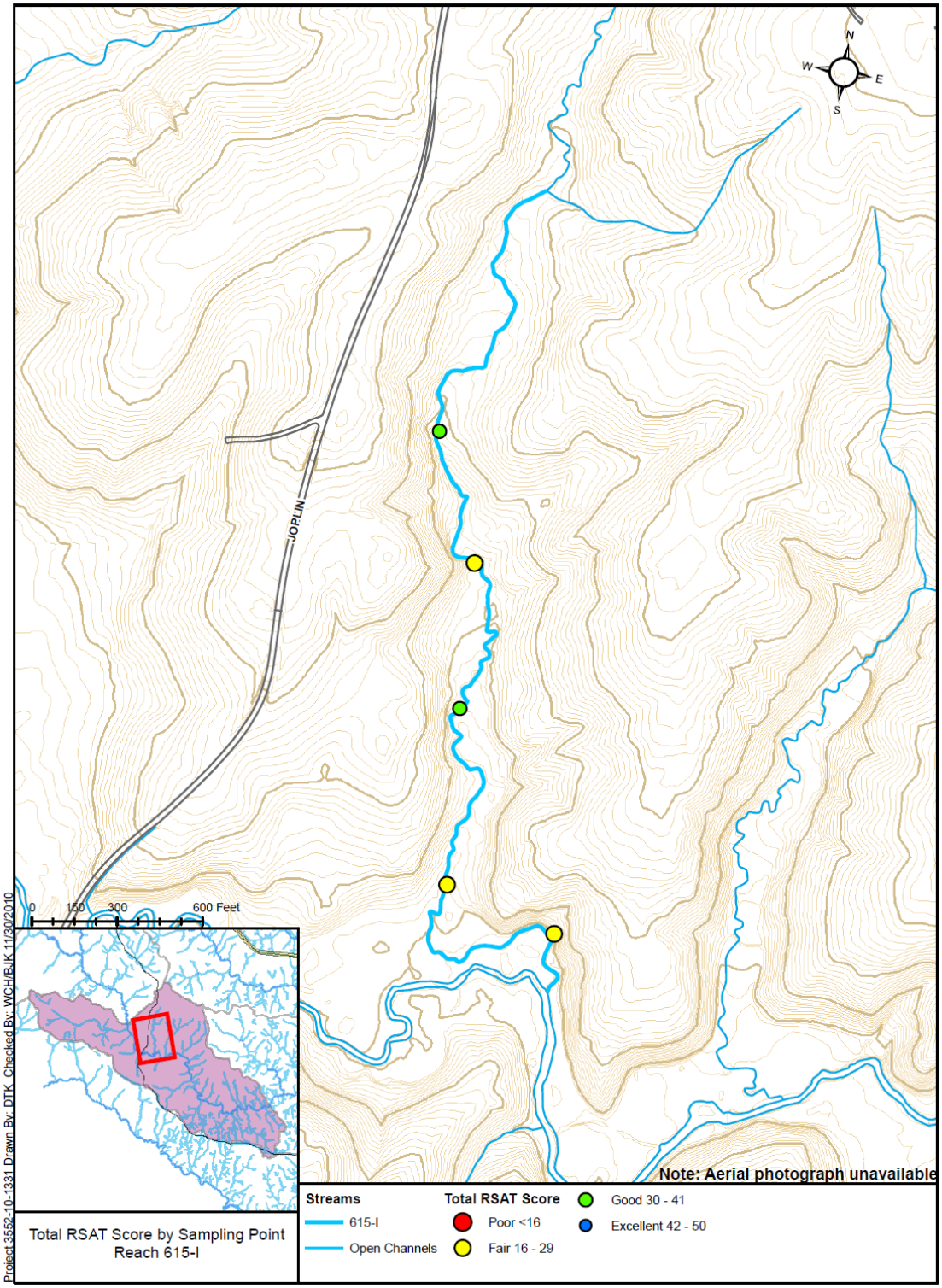
General Description:
Reach 615-I is a fair quality stream, with an average total RSAT score of 28. Reach 615-I has good channel stability, with stable streambanks, little bank sloughing or erosion, and resistant bed and bank materials. Channel scouring/deposition and physical instream habitat scores were fair, with increased embeddedness of riffle material, few deep pools and a shallow riffle and run dominated morphology.



Riparian habitat is in excellent condition, with a wide forested buffer in excess of 200ft on either side of the channel, and canopy cover is dense, providing greater than 80% shading. Biological indicators are fair, with a few pollution-tolerant species, such as caddisfly and midgefly. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and reduced depth of visibility.

Problem Areas:
None

Recommendations:
None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JOPLIN
0
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600 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Total RSAT Score by Sampling Point
Reach 615-I
Note: Aerial photograph unavailable
Streams
615-I
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50

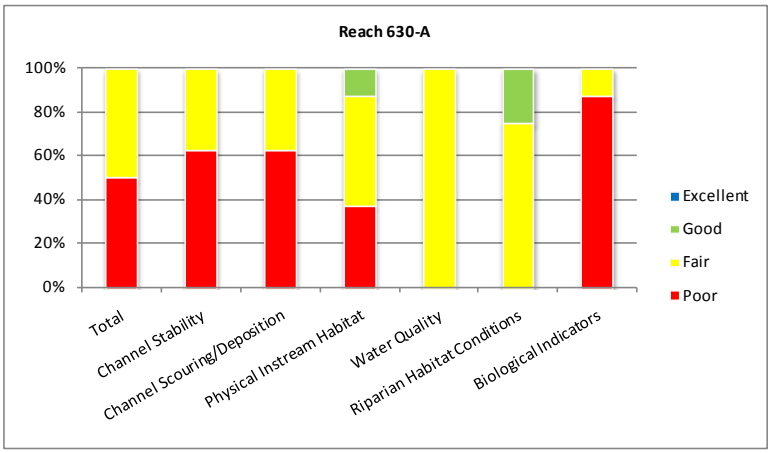
Basin 630, Dewey's Creek - Project Reach Descriptions

Reach Name: 630-A

Coordinates (NAD 83, Virginia State Plane North):
11822962.95, 6894168.06 to 11823033.98, 6890886.59

Average RSAT Score: 15

General Description:



Reach 630-A is an example of a poor quality stream, with an average total RSAT score of only 15. The low score is due mainly to widespread, systemic channel erosion, coupled with large amounts of sand and sediment deposition, and no available biological indicators. Channel stability along Reach 630-A had an average score of 2, with more than 50% of the streambanks experiencing sloughing or scour, undercut streambanks, and frequent tree falls, with streambanks consisting of highly erodible, sandy soils. Bank erosion is particularly severe on the outside of bends, in areas where riparian vegetation is sparse, and alongside freshly deposited sand bars. Channel scouring/deposition and physical instream habitat scores were fair, with an increasing number of depositional features, nearly 75% embeddedness of riffle material, few pools (most appeared to have been filled in with sediment).

Riparian habitat is in fair condition, with a predominantly wooded corridor, but with large gaps in woody vegetation and canopy coverage. Biological indicators are absent along this reach (resulting in a score of 0). Water quality is fair, with a moderate level of substrate fouling, increased TDS, and a depth of visibility no more than 1ft.

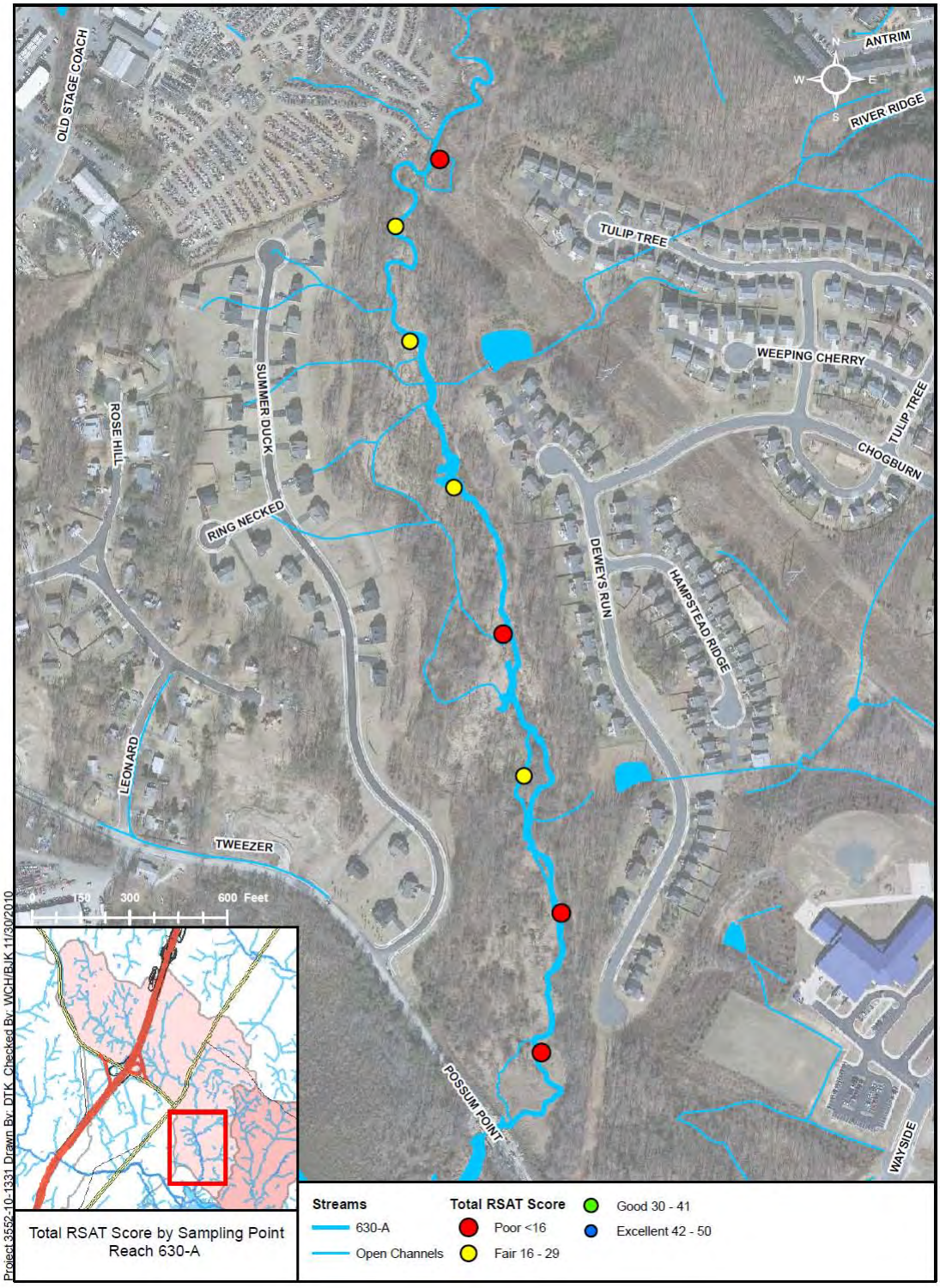
Problem Areas:

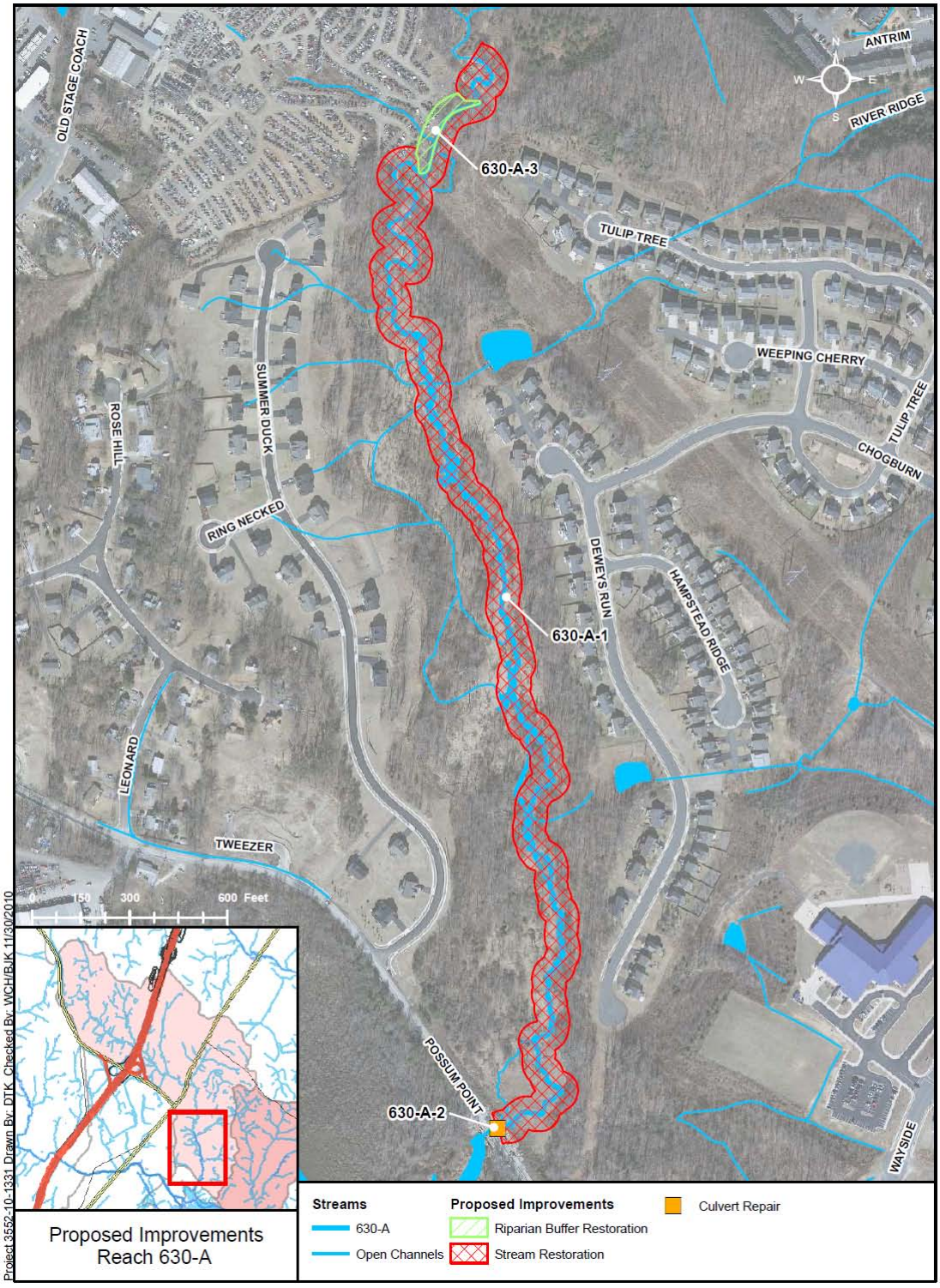
- Channel incision and widening along the lower portion of the basin, from Tulip Tree Place to Possum Point Road, has resulted in widespread, systemic bank erosion.
    - Removal of the riparian forest, encroachment on the stream corridor, and dumping of debris has left streambanks susceptible to overbank runoff, gully erosion and localized bank erosion, behind Skip's Auto Parts at the intersection of Jefferson Davis Highway and Old Stage Coach Road.

- Sediment and debris (resulting from channel erosion upstream) has been deposited at the Possum Point Road culvert, severely restricting flow, reducing flood capacity, and posing a risk to public safety and infrastructure.

Recommendations:

- Restore more than 4300ft of stream, from Tulip Tree Place to Possum Point Road, using fabric and plant bank treatment with live fascines or brush mattress to provide immediate vegetative cover, and up to 14 rock riffles for permanent grade stabilization.
  - Remove debris and rubble from the streambanks behind Skip's Auto Parts (at the intersection of Jefferson Davis Highway and Old Stage Coach Road) and restore the riparian buffer zone with seed, straw and container plants (at a planting density of up to 1200 stems/acre) along 250 linear feet of channel. Establish a conservation easement, or permanent deed restriction area, to protect the buffer zone to a minimum of 100ft from the channel.
  - Repair or retrofit the culvert at Possum Point Road with up to 4 rock weirs or wing deflectors and a floating trash rack to focus the flow, enhance sediment transport, trap woody debris, and prevent siltation of the culverts.


OLD STAGE COACH
ANTRIM
RIVER RIDGE
TULIP TREE
WEEPING CHERRY
TULIP TREE
CHOGBURN
SUMMER DUCK
ROSE HILL
RING NECKED
DEWEY'S RUN
HAMPSTEAD RIDGE
LEONARD
TWEEZER
POSSUM POINT
WAYSIDE
0 150 300 600 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Total RSAT Score by Sampling Point
Reach 630-A
Streams
630-A
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50

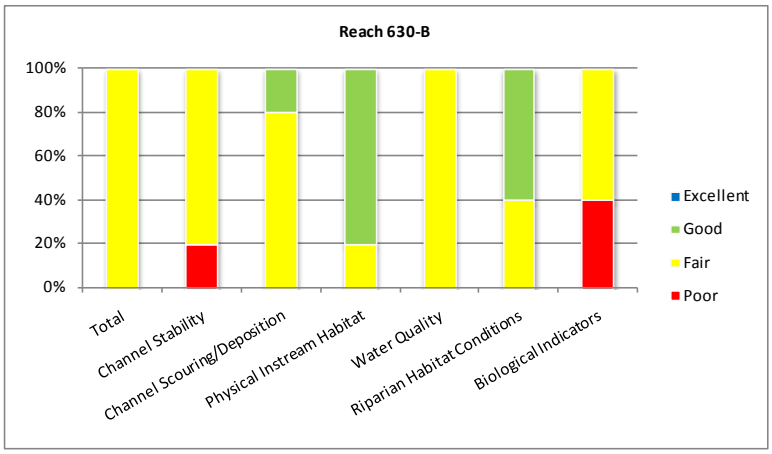

OLD STAGE COACH
ANTRIM
RIVER RIDGE
630-A-3
TULIP TREE
WEEPING CHERRY
TULIP TREE
CHOGBURN
SUMMER DUCK
ROSE HILL
RING NECKED
DEWEYS RUN
HAMPSTEAD RIDGE
630-A-1
LEONARD
TWEEZER
0 150 300 600 Feet
POSSUM POINT
630-A-2
WAYSIDE
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Proposed Improvements
Reach 630-A
Streams
630-A
Open Channels
Proposed Improvements
Riparian Buffer Restoration
Stream Restoration
Culvert Repair

Reach Name: 630-B

Coordinates (NAD 83, Virginia State Plane North):
11822467.88, 6895752.49 to 11822940.41, 6894169.88

Average RSAT Score: 22

General Description:



Reach 630-B is a fair quality stream, with an average total RSAT score of 22. Channel widening is responsible for low channel stability scores (with an average value of 4) and widespread bank erosion along approximately 50% of the reach. Channel scouring/deposition scores were fair, with increased deposition of sand and sediment and increased embeddedness of riffle material. Physical instream habitat was in good condition, despite systemic erosion and subsequent deposition downstream. A good mix of riffles, runs and pools is present, along with a heterogeneous mix of bed materials, consisting of cobbles, gravel, sand and sediment.

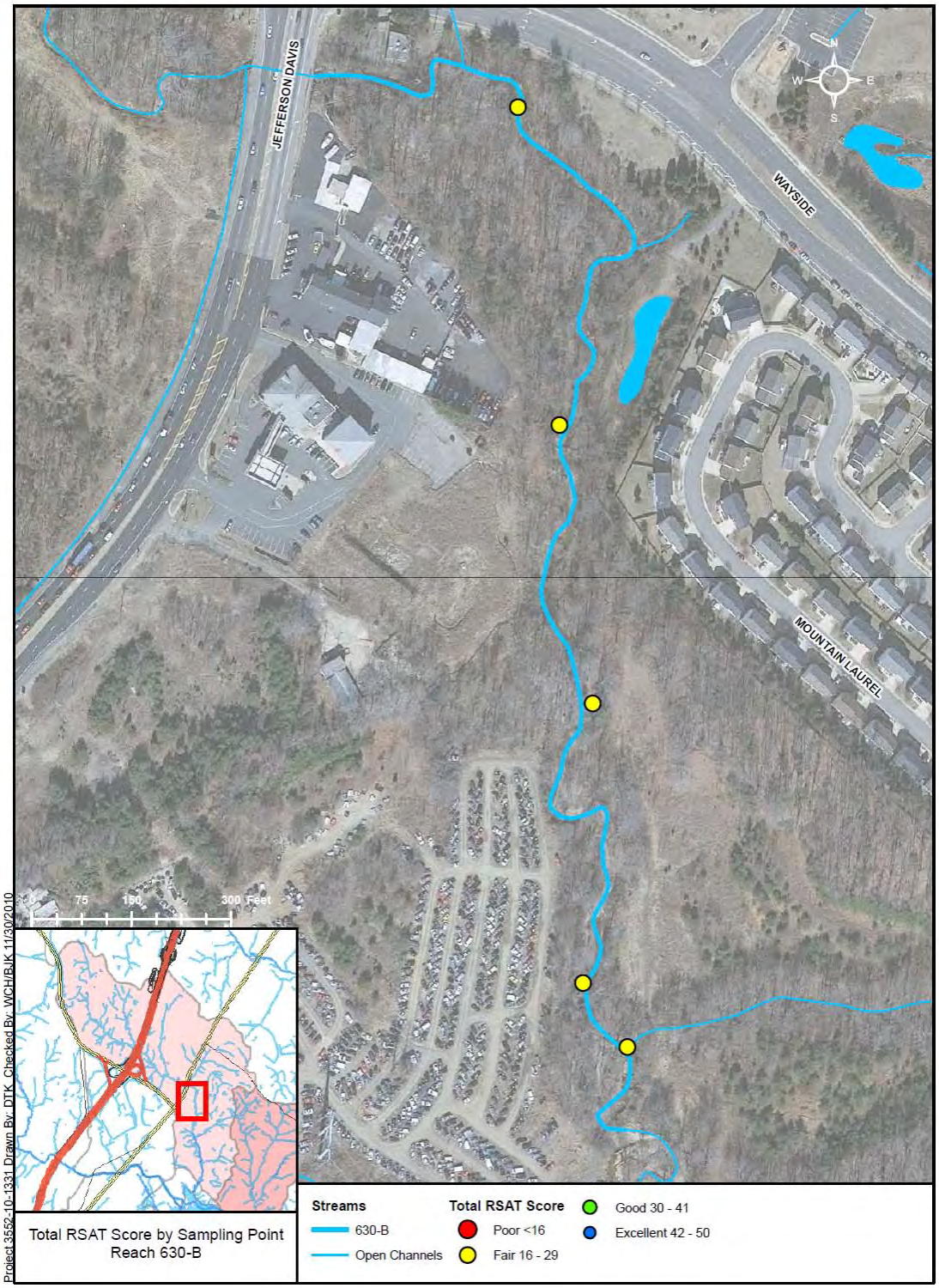
Riparian habitat is in good condition, with a forested buffer of at least 100ft on either side of the channel, and dense canopy cover, providing approximately 60-79% shading. Biological indicators are poor, with a small population of the most pollution-tolerant macroinvertebrates. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and reduced depth of visibility.

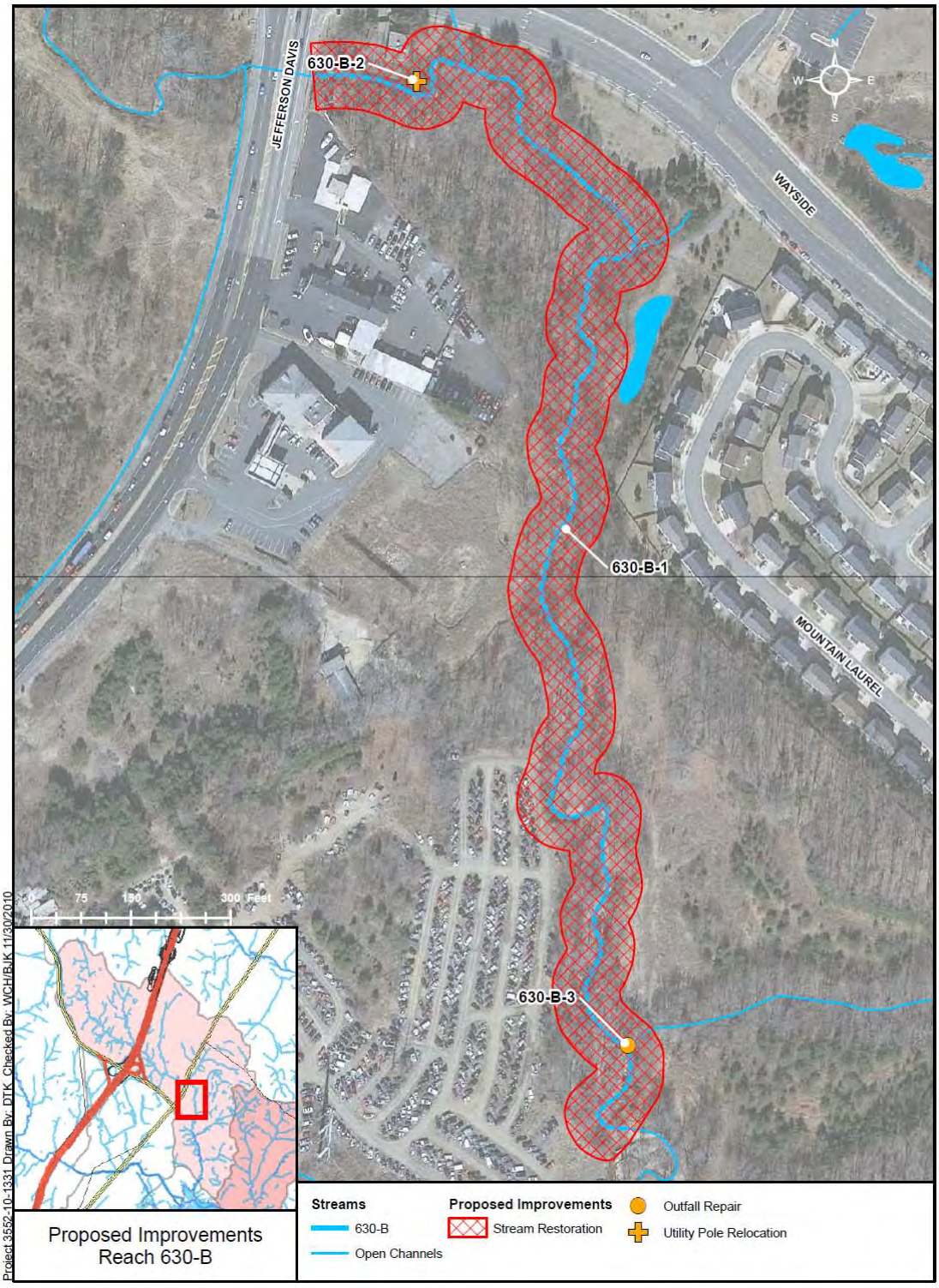
Problem Areas:

- Channel incision and widening has resulted in systemic streambank erosion, downstream from Jefferson Davis Highway to the upstream end of Reach 630-A.
    - A large woody debris jam, approximately 100 feet downstream from Jefferson Davis Highway, has resulted in localized bank erosion, which threatens to undermine an existing utility pole on the left descending (north) bank.
    - Channel incision along an unnamed tributary, south of Wayside Drive and west of Mountain Laurel Loop, has undermined an existing concrete pipe outfall and headwall along the left descending bank, creating a vertical drop of more than 8 feet.

Recommendations:

- Restore more than 2300ft of stream, from Jefferson Davis Highway to Tulip Tree Place, using fabric and plant bank treatment with rock toe to stabilize eroding streambanks, and up to 6 rock riffles for permanent grade stabilization.
    - Relocate an undermined utility pole along the left descending (north) bank, remove a large woody debris jam, and restore approximately 100 feet of eroded streambank downstream from Jefferson Davis Highway.
    - Stabilize 200ft of tributary, south of Wayside Drive and west of Mountain Laurel Loop, using fabric and plant bank treatment with rock toe, and replace the undermined pipe outfall and headwall.


JEFFERSON DAVIS
WAYSIDE
MOUNTAIN LAUREL
N
W
E
S
75
150
300 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Total RSAT Score by Sampling Point
Reach 630-B
Streams
630-B
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50

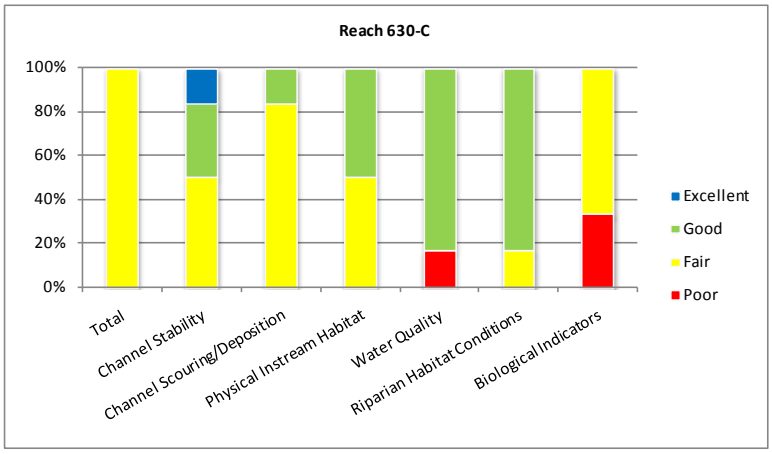

630-B-2
JEFFERSON DAVIS
WAYSIDE
630-B-1
MOUNTAIN LAUREL
630-B-3
N
W
E
S
75
150
300 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Proposed Improvements
Reach 630-B
Streams
630-B
Open Channels
Proposed Improvements
Stream Restoration
Outfall Repair
Utility Pole Relocation

Reach Name: 630-C

Coordinates (NAD 83, Virginia State Plane North):
11820193.75, 6897437.44 to 11822373.72, 6895769.05

Average RSAT Score: 26

General Description:



Reach 630-C is a fair quality stream, with an average total RSAT score of 26. Reach 630-C has good channel stability, with relatively stable streambanks, little bank sloughing or erosion, and resistant bed and bank materials. Channel scouring/deposition scores were fair, with increased deposition of sand and sediment and increased embeddedness of riffle material. Physical instream habitat was in good condition, with a mix of riffles, runs and deep pools present, along with a heterogeneous mix of bed materials, consisting of cobbles, gravel, sand and sediment.

Riparian habitat is in good condition, with a forested buffer of at least 100ft on either side of the channel, and dense canopy cover, providing approximately 60-79% shading. Biological indicators are poor, with only a small population of pollution-tolerant macroinvertebrates. Water quality is good, with a low level of substrate fouling, moderate TDS, and visibility to a depth of nearly 3ft.

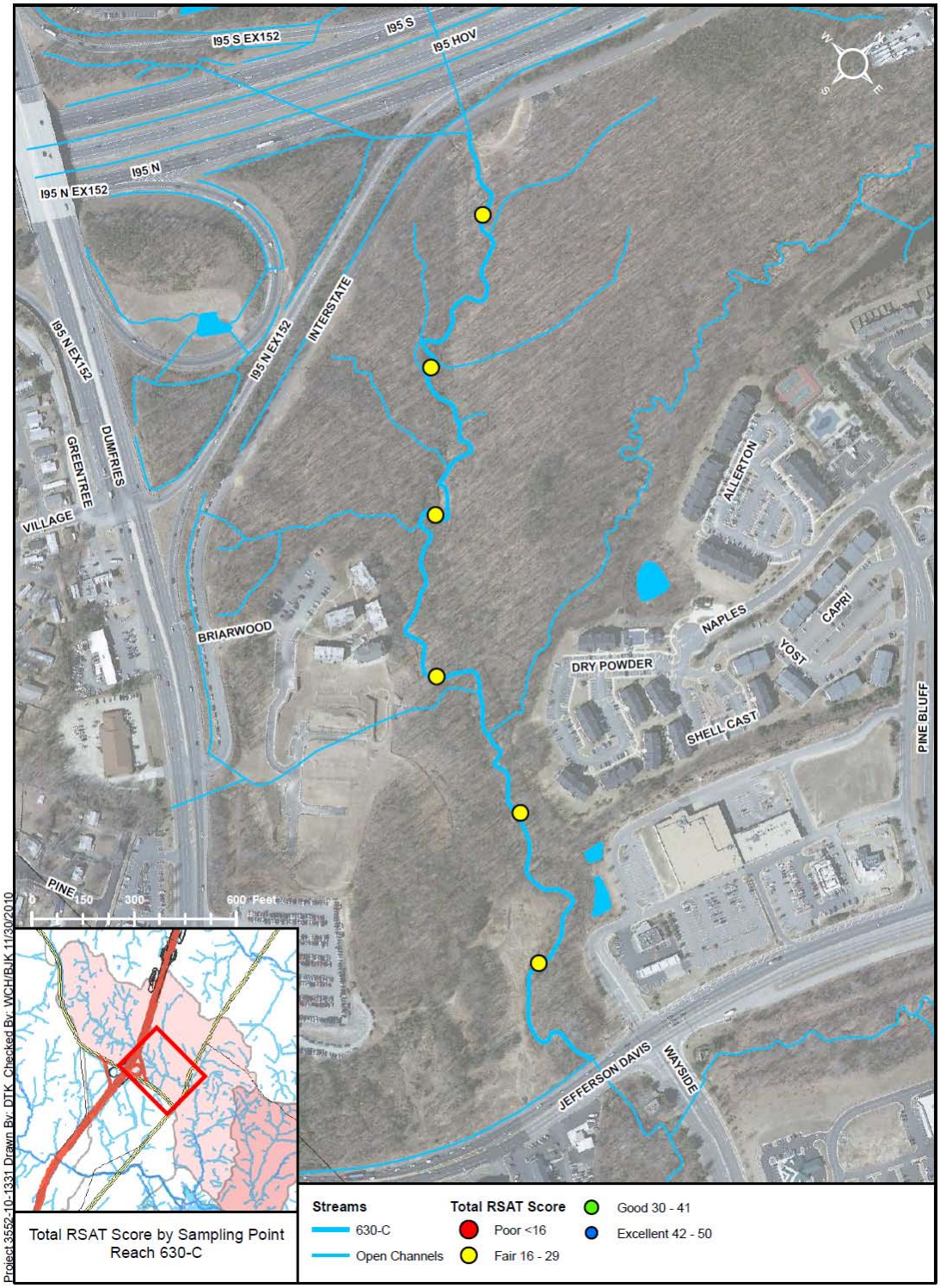
Problem Areas:

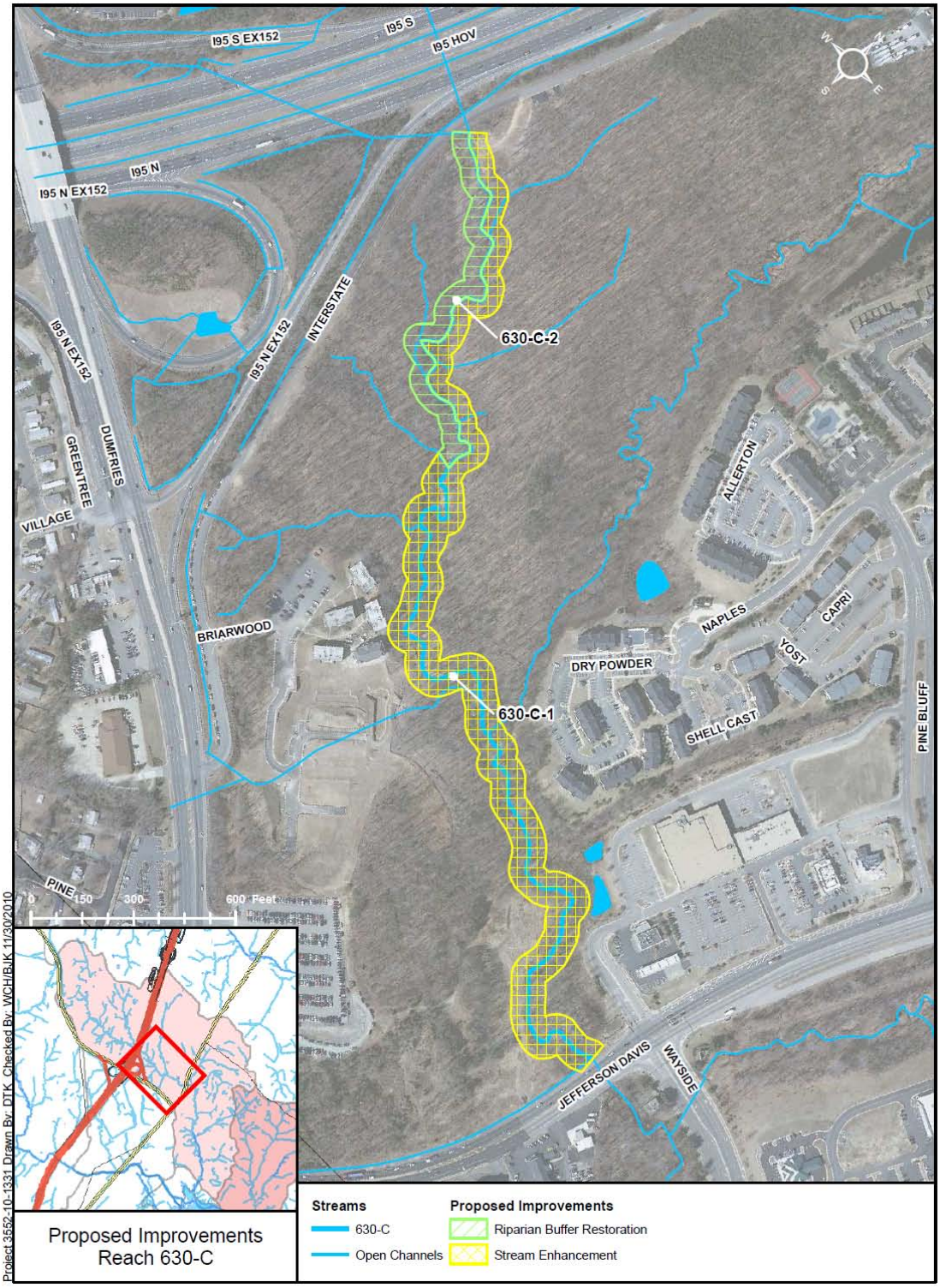
- Localized bank erosion and subsequent deposition of coarse gravel and sediments threaten adjacent properties between Interstate I-95 and Jefferson Davis Highway.
    - Streambank erosion is particularly severe in the vicinity of the apartment/condominium complex at Briarwood and Interstate Drives.
    - Removal of riparian vegetation and loss of associated root mass has left the streambank vulnerable to continued erosion and mass wasting, along a temporary access road on the right descending bank, downstream of Interstate Drive to Dry Powder Circle.

Recommendations:

- Enhance nearly 3800ft of degraded stream, from Interstate 1-95 to Jefferson Davis Highway, using fabric and plant bank treatment and up to 12 rock weirs or wing deflectors to reduce bank scouring.

- Restore the riparian buffer zone with seed, straw and container plants (at a planting density of up to 1200 stems/acre) along 1000 linear feet of channel, downstream of Interstate Drive to Dry Powder Circle. Establish a conservation easement, or permanent deed restriction area, to protect the buffer zone to a minimum of 100ft from the channel.


I95 S EX152
I95 S
I95 HOV
I95 N
I95 N EX152
INTERSTATE
DUMFRIES
GREENTREE
VILLAGE
BRIARWOOD
ALLERTON
NAPLES
CAPRI
YOST
DRY POWDER
SHELL CAST
PINE BLUFF
JEFFERSON DAVIS
WAYSIDE
PINE
0 150 300 600 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Total RSAT Score by Sampling Point
Reach 630-C
Streams
630-C
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50

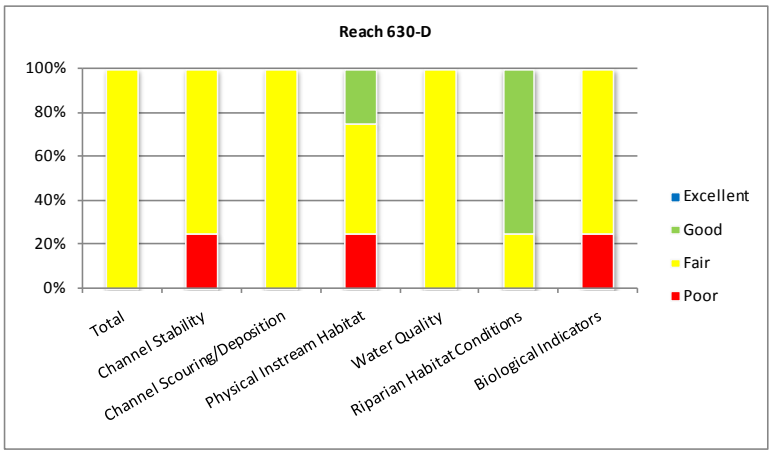

I95 S EX152
I95 S
I95 HOV
I95 N
I95 N EX152
INTERSTATE
I95 N EX152
I95 N EX152
630-C-2
630-C-1
GREENTREE
DUMFRIES
VILLAGE
BRIARWOOD
ALLERTON
NAPLES
CAPRI
YOST
DRY POWDER
SHELL CAST
PINE BLUFF
PINE
JEFFERSON DAVIS
WAYSIDE
0 150 300 600 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/EJK 11/30/2010
Proposed Improvements
Reach 630-C
Streams
630-C
Open Channels
Proposed Improvements
Riparian Buffer Restoration
Stream Enhancement

Reach Name: 630-D

Coordinates (NAD 83, Virginia State Plane North):
11818042.79, 6898816.70 to 11819766.46, 6897648.47

Average RSAT Score: 21

General Description:
Reach 630-D is a fair quality stream, with an average total RSAT score of 21. Channel incision and widening is responsible for low channel stability scores and bed and bank erosion along nearly 50% of the reach. Channel scouring/deposition and physical instream habitat scores were fair, with an increase in deposition, increased embeddedness of riffle material, and a low number of deep pools.



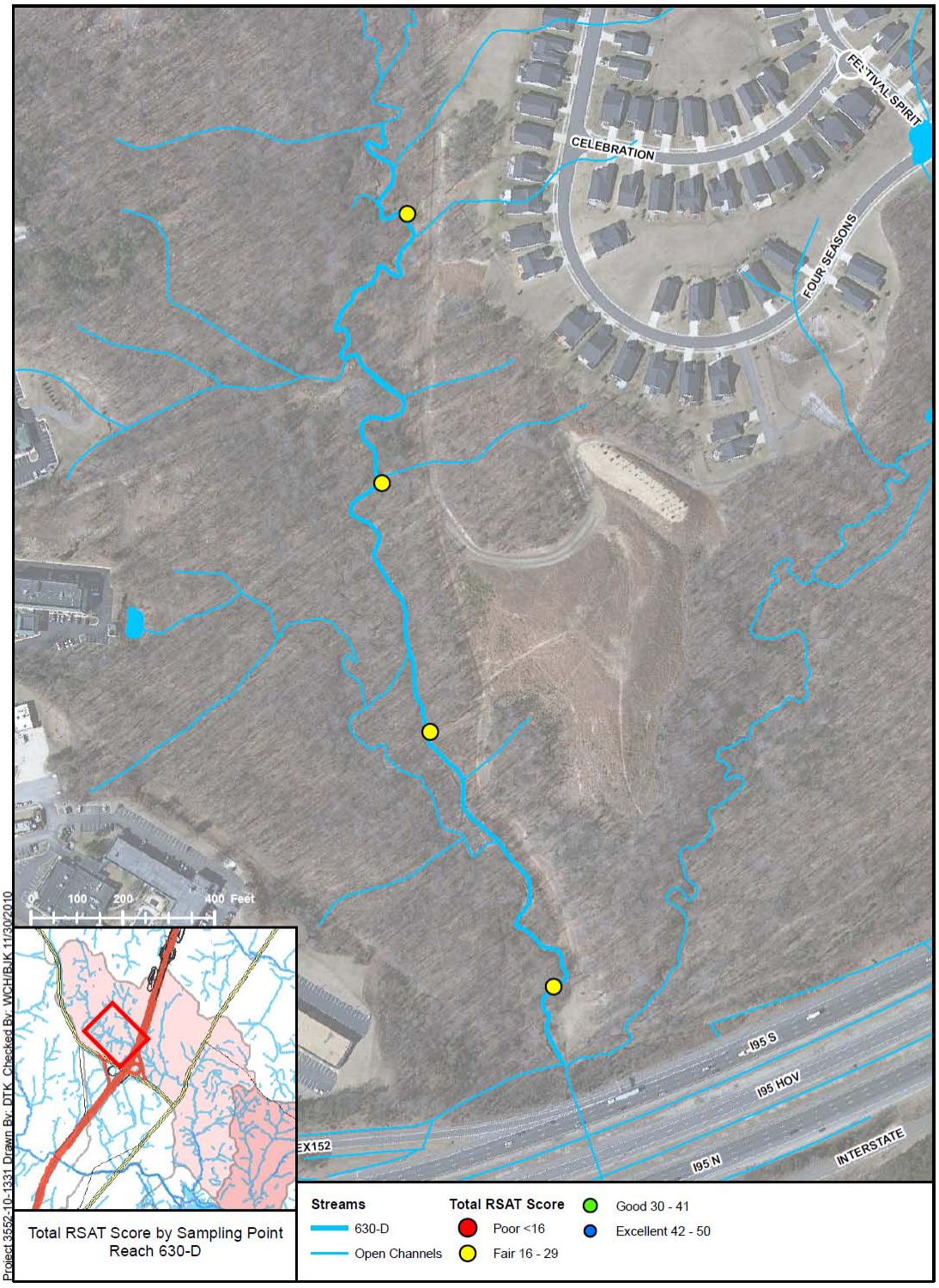
Riparian habitat is in good condition, with a forested buffer of at least 100ft on either side of the channel, and dense canopy cover, providing approximately 60-79% shading. Biological indicators are fair, with a few pollution-tolerant species, such as caddisfly and midgefly. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and reduced depth of visibility.

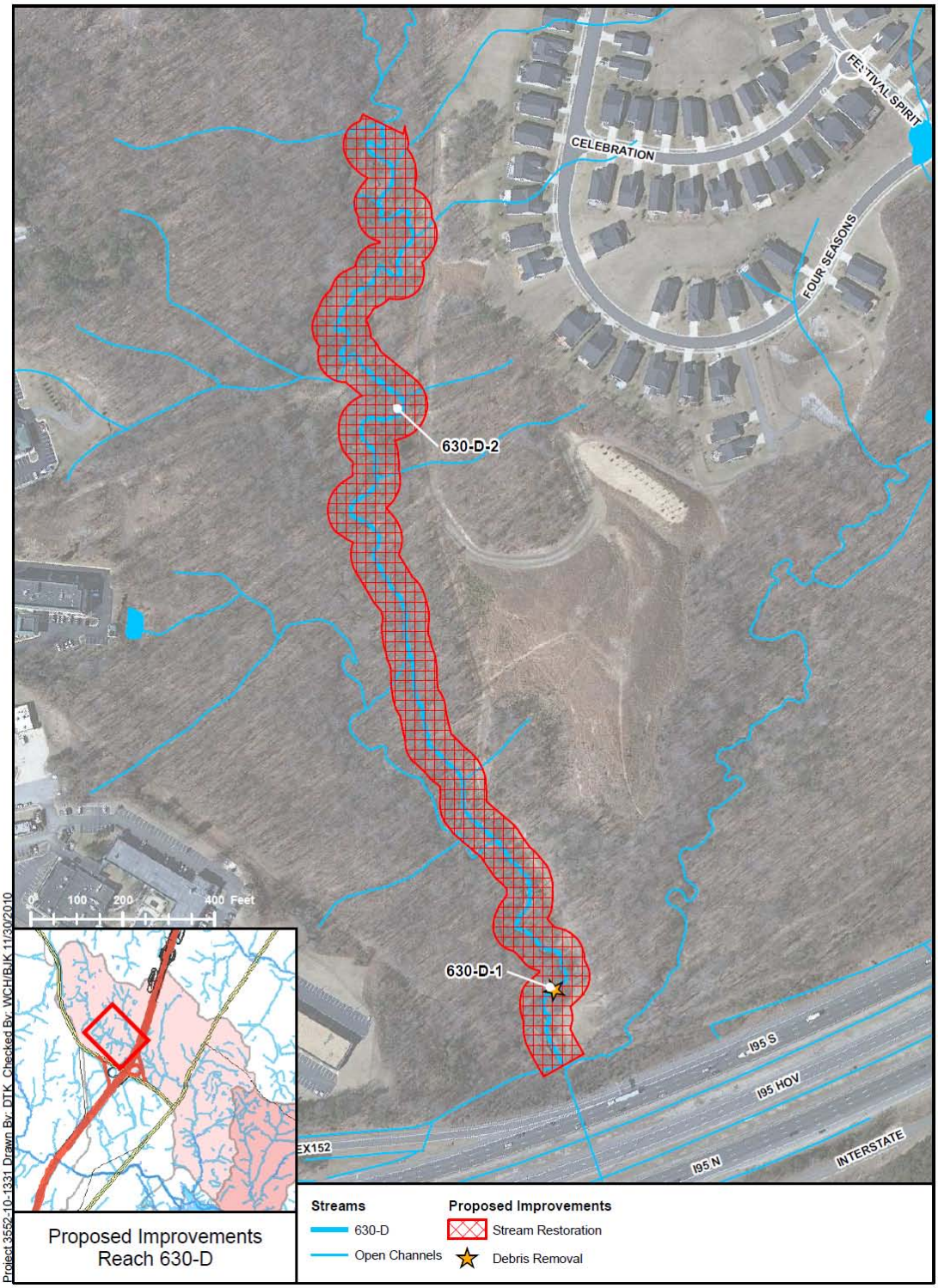
Problem Areas:

- Channel incision and widening has resulted in systemic streambank erosion, and exposure of a previously buried sewer line parallel to the stream, south of Four Seasons Drive to the culvert at Interstate I-95.
    - Illegal dumping of concrete rubble, tires and other debris (via an access road from Old Stage Road) has created and impoundment in the channel, interfering with the flow of water and sediment.

Recommendations:

- Realign and restore more than 2800ft of stream channel, along the sewer line south of Four Seasons Drive to the culvert at Interstate I-95, using fabric and plant bank treatment with rock toe to stabilize eroding streambanks, and up to 7 rock riffles for permanent grade stabilization.
    - Remove dumped rubble, tires and other debris, creating an impoundment near the access road from Old Stage Road, prior to restoration.


FESTIVAL SPIRIT
CELEBRATION
FOUR SEASONS
0 100 200 400 Feet
I95 S
I95 HOV
I95 N
INTERSTATE
EX152
Streams
630-D
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50
Total RSAT Score by Sampling Point
Reach 630-D
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010

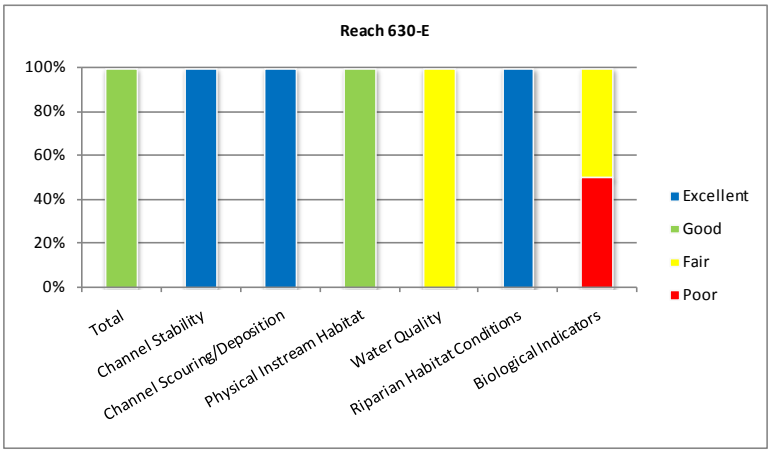

CELEBRATION
FESTIVAL SPIRIT
FOUR SEASONS
630-D-2
630-D-1
0 100 200 400 Feet
I95 S
I95 HOV
I95 N
INTERSTATE
EX152
Streams
630-D
Open Channels
Proposed Improvements
Stream Restoration
Debris Removal
Proposed Improvements
Reach 630-D
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010

Reach Name: 630-E

Coordinates (NAD 83, Virginia State Plane North):
11817549.20, 6899377.19 to 11818042.79, 6898816.70

Average RSAT Score: 34

General Description:
Reach 630-E is a good quality stream, with an average total RSAT score of 36. Reach 630-E has excellent channel stability and scouring/deposition scores, due to stable streambanks, few signs of bank sloughing or erosion, and resistant bed and bank materials. Physical instream habitat scores are good, with a mix of riffle, run and pool habitat, and a varied velocity and depth regime.



Riparian habitat is in excellent condition, with a wide forested buffer in excess of 200ft on either side of the channel, and canopy cover is dense, providing greater than 80% shading. However, biological indicators are poor, with a limited population of pollution-tolerant midgeflies and snails. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and reduced depth of visibility.

Problem Areas:
None

Recommendations:
None

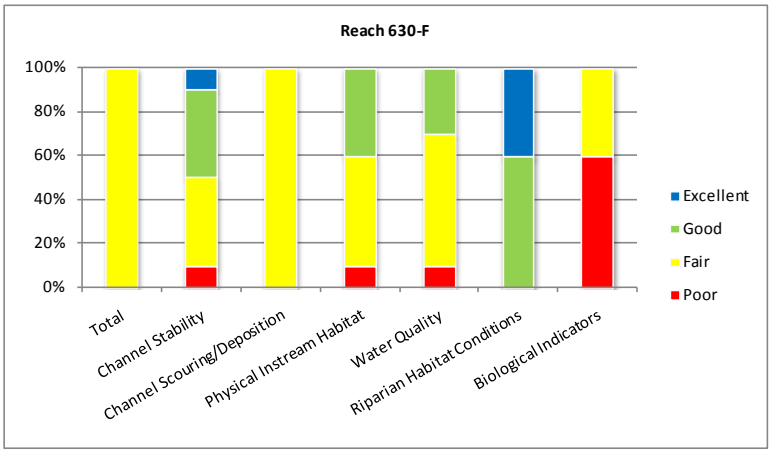

CHAMPION OAK
FOUR SEASONS
0 40 80 160 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Total RSAT Score by Sampling Point
Reach 630-E
Streams
630-E
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50

Reach Name: 630-F

Coordinates (NAD 83, Virginia State Plane North):
11822018.15, 6900262.19 to 11821486.97, 6896226.01

Average RSAT Score: 24

General Description:
Reach 630-F is a fair quality stream, with an average total RSAT score of 24. Channel incision is responsible for low channel stability scores and bed and bank erosion along nearly 50% of the reach. Channel scouring/deposition and physical instream habitat scores were fair, with an increase in deposition, increased embeddedness of riffle material, and few deep pools.



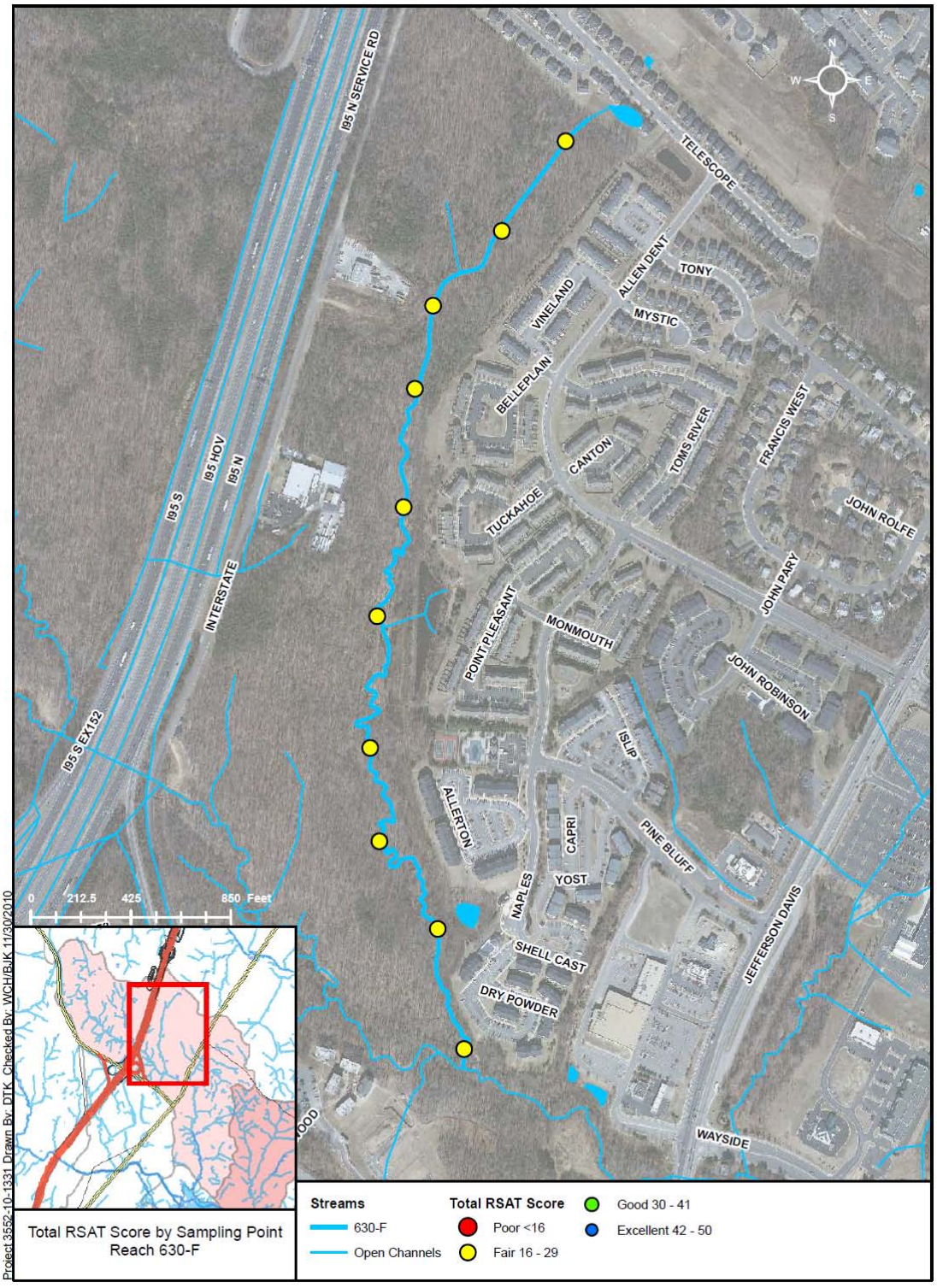
Riparian habitat is in good condition, with a forested buffer of at least 100ft on either side of the channel, and dense canopy cover, providing more than 60% shading. Biological indicators are poor, with only a few midgeflies found throughout the reach. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and reduced depth of visibility.

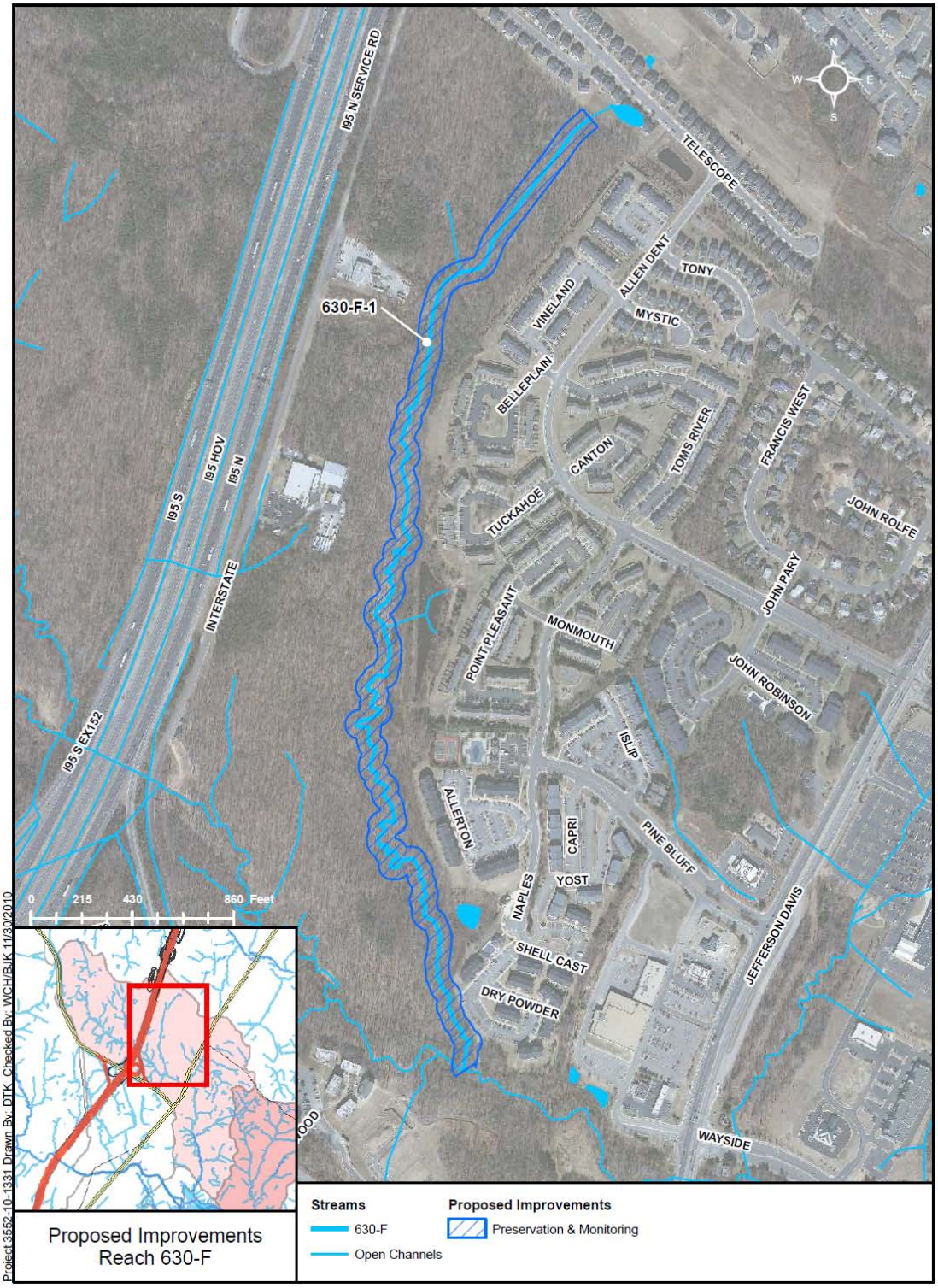
Problem Areas:

- Moderate channel incision has been slowed by woody debris jams (that act as natural *de facto* grade control) and bank stabilization provided by a wide riparian forest buffer, from the upstream end of the reach at Telescope Lane, to the confluence with Reach 630-C near Dry Powder Circle.

Recommendations:

- Purchase, preserve and monitor the existing riparian corridor with a permanent deed restriction or conservation easement, along more than 5300ft of stream, from the upstream end of the reach at Telescope Lane, to the confluence with Reach 630-C near Dry Powder Circle.


I95 N SERVICE RD
I95 S
I95 HOV
I95 N
INTERSTATE
I95 S EX152
TELESCOPE
ALLEN DENT
TONY
MYSTIC
VINELAND
BELLEPLAIN
CANTON
TOMS RIVER
FRANCIS WEST
JOHN ROLFE
TUCKAHOE
JOHN PARY
POINT PLEASANT
MONMOUTH
JOHN ROBINSON
ISLIP
ALLERTON
CAPRI
PINE BLUFF
YOST
NAPLES
SHELL CAST
DRY POWDER
JEFFERSON DAVIS
WAYSIDE
0 212.5 425 850 Feet
Streams
630-F
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50
Total RSAT Score by Sampling Point
Reach 630-F
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010


630-F-1
I95 N SERVICE RD
I95 S
I95 HOV
I95 N
INTERSTATE
I95 S EX152
TELESCOPE
ALLEN DENT
TONY
MYSTIC
VINELAND
BELLEPLAIN
CANTON
TOMS RIVER
FRANCIS WEST
JOHN ROLFE
TUCKAHOE
JOHN PARY
POINT PLEASANT
MONMOUTH
JOHN ROBINSON
ISLIP
ALLERTON
CAPRI
PINE BLUFF
NAPLES
YOST
SHELL CAST
DRY POWDER
JEFFERSON DAVIS
WAYSIDE
0 215 430 860 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Proposed Improvements
Reach 630-F
Streams
630-F
Open Channels
Proposed Improvements
Preservation & Monitoring

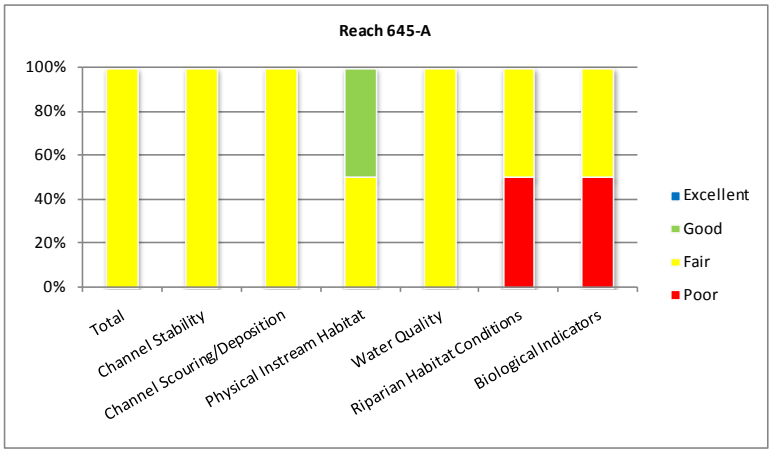
Basin 645, Upper Little Creek - Project Reach Descriptions

Reach Name: 645-A

Coordinates (NAD 83, Virginia State Plane North):
11814844.57, 6885068.40 to 11815470.37, 6884445.63

Average RSAT Score: 18

General Description:



Reach 645-A is a fair quality stream, with an average total score of 18. Channel stability scores along this reach are influenced significantly by localized bank erosion, with approximately 50-70% of the streambanks experiencing sloughing or scour. Bank erosion is particularly severe near Creek Road, where residential development has encroached on the stream corridor and riparian vegetation has been removed. Channel scouring/deposition and physical instream habitat scores were fair, with an increasing number of depositional features, increased embeddedness of riffle material, and few deep pools.

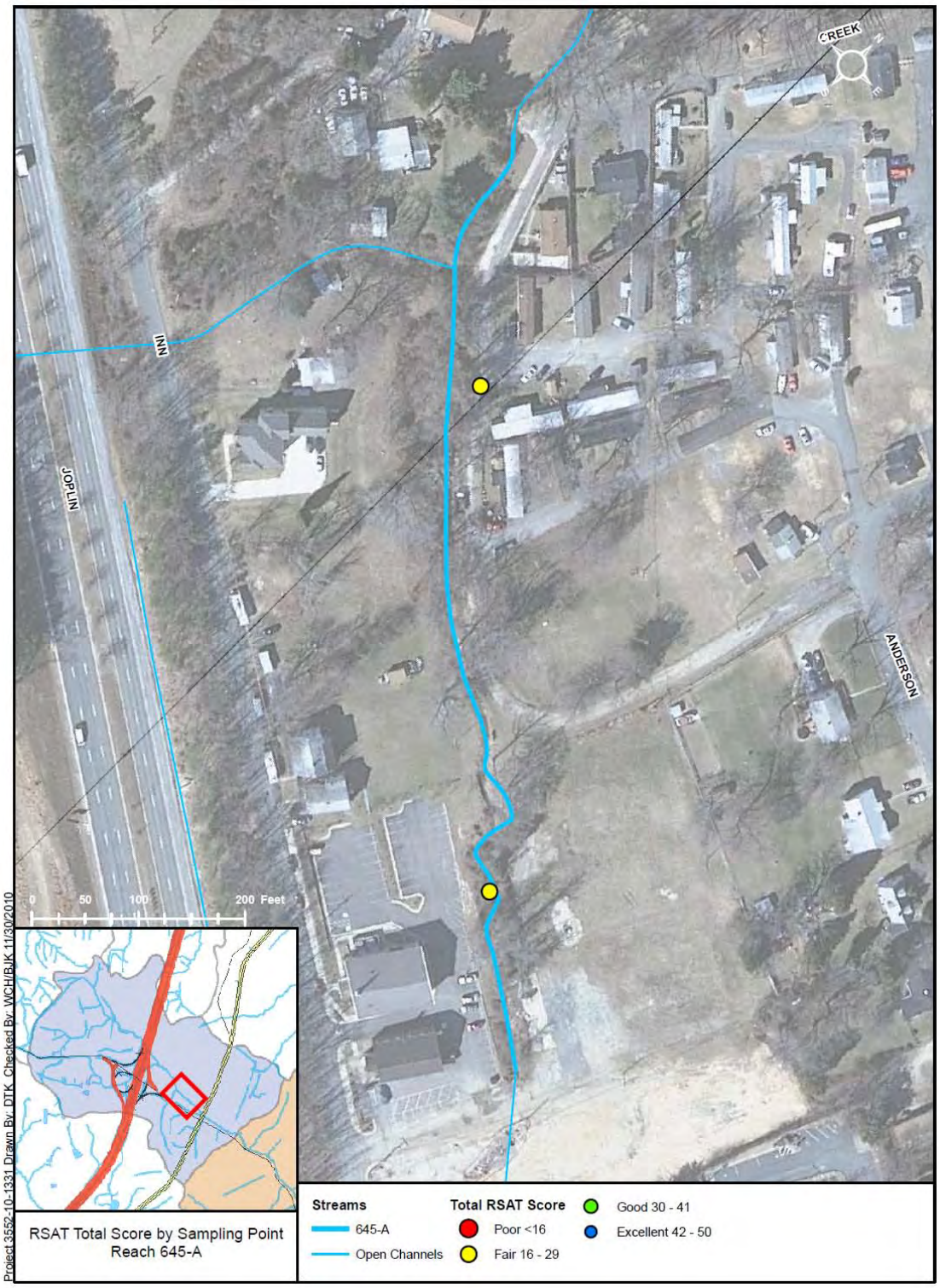
Riparian habitat is in poor condition, with only a narrow band of trees and very little woody vegetation near Creek Road and adjacent to the parking lot at First Assembly of God Church. Biological indicators are poor, with only a few midgeflies found throughout the reach. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and a depth of visibility no more than 1ft.

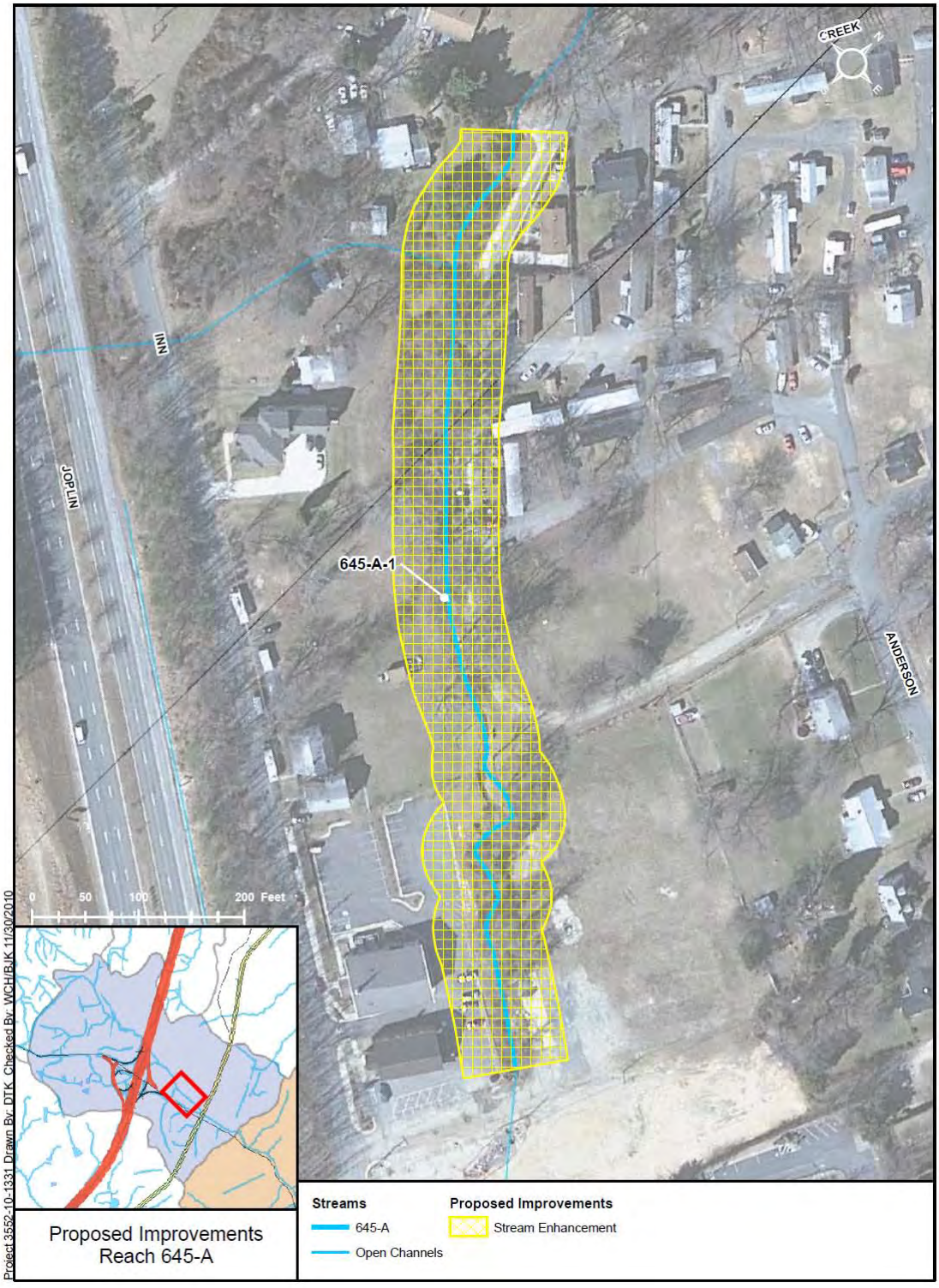
Problem Areas:

- Removal of riparian forest and encroachment on the stream corridor has prompted localized bank erosion and mass wasting from Creek Road to the parking lot at First Assembly of God Church.

Recommendations:

- Enhance approximately 950ft of degraded stream, from Creek Road to the parking lot at First Assembly of God Church, using fabric and plant bank treatment and up to 3 rock weirs or wing deflectors to reduce bank scouring.


CREEK
INN
JOPLIN
ANDERSON
0
50
100
200 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
RSAT Total Score by Sampling Point
Reach 645-A
Streams
645-A
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50

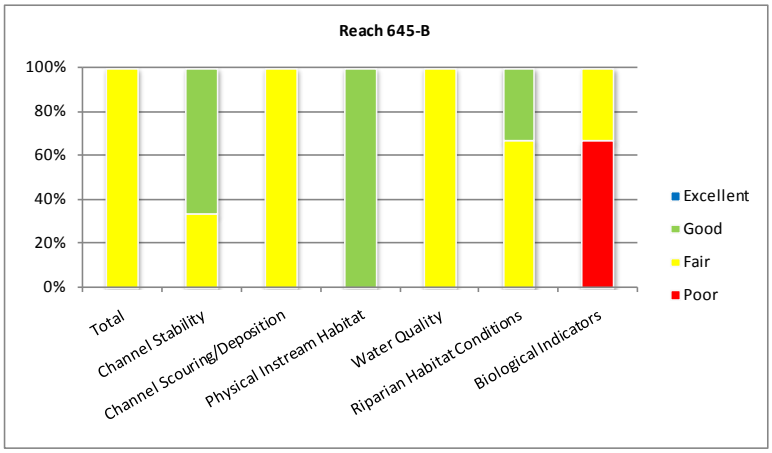

CREEK
JOPLIN
645-A-1
ANDERSON
0 50 100 200 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Proposed Improvements
Reach 645-A
Streams
645-A
Open Channels
Proposed Improvements
Stream Enhancement

Reach Name: 645-B

Coordinates (NAD 83, Virginia State Plane North):
11814115.89, 6886010.69 to 11814832.29, 6885086.15

Average RSAT Score: 22

General Description:



Reach 645-B is a fair quality stream, with an average total score of 22. Channel stability scores along this reach are influenced significantly by localized bank erosion and channel widening, with approximately 50% of the streambanks experiencing sloughing or scour. Bank erosion is particularly severe along the lower portion of this reach, approaching Creek Road, where residential development has encroached on the stream corridor and riparian vegetation has been removed. Channel scouring/deposition and scores were fair, with an increasing number of depositional features and increased embeddedness of riffle material. Physical instream habitat scores are good, with a mix of riffle, run and pool habitat, and a varied velocity and depth regime.

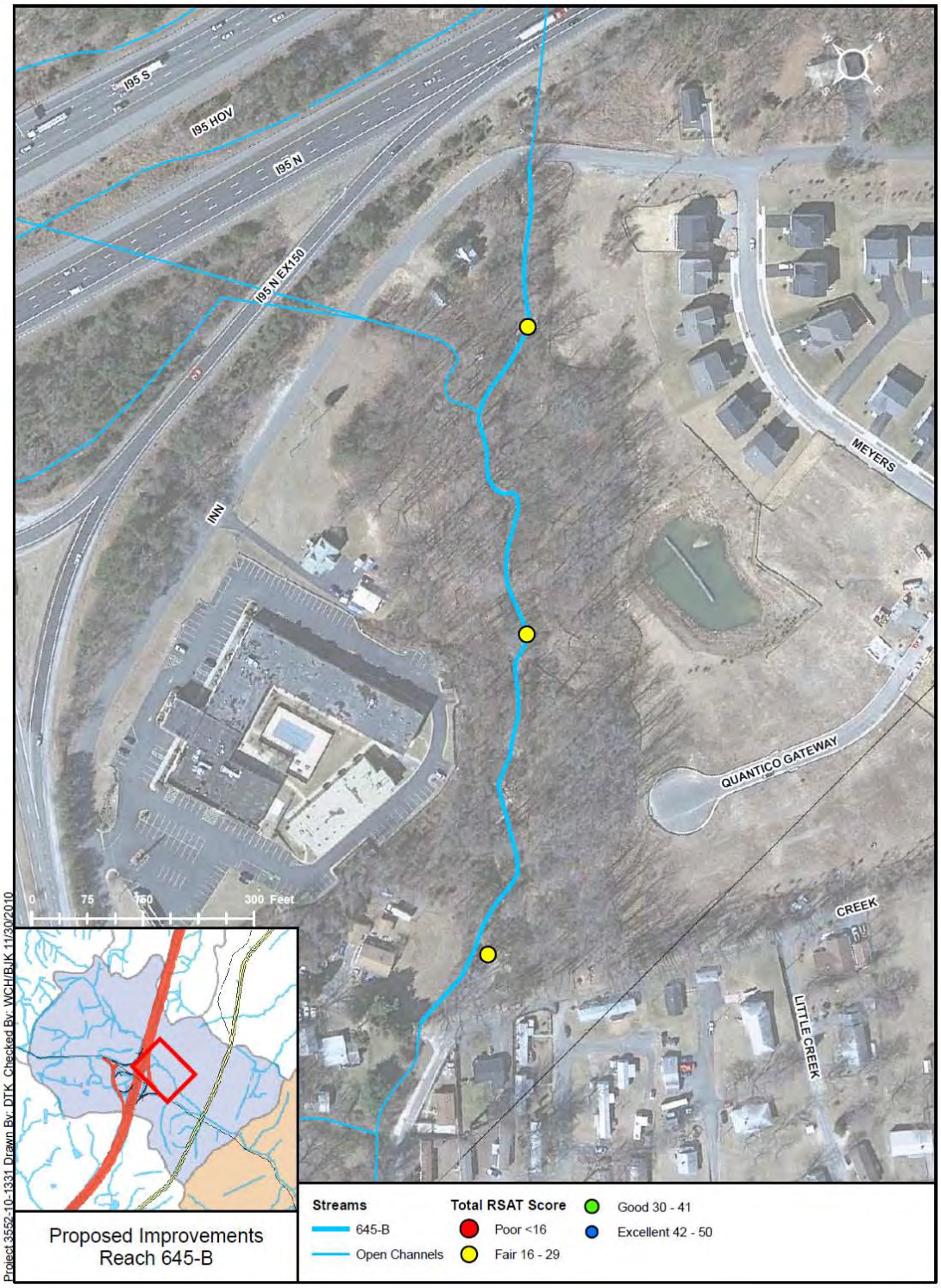
Riparian habitat is in fair condition, with a predominantly wooded corridor, but with large gaps in woody vegetation and canopy coverage. Biological indicators are poor, with only a few midgeflies found throughout the reach. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and a depth of visibility to approximately 1.5ft.

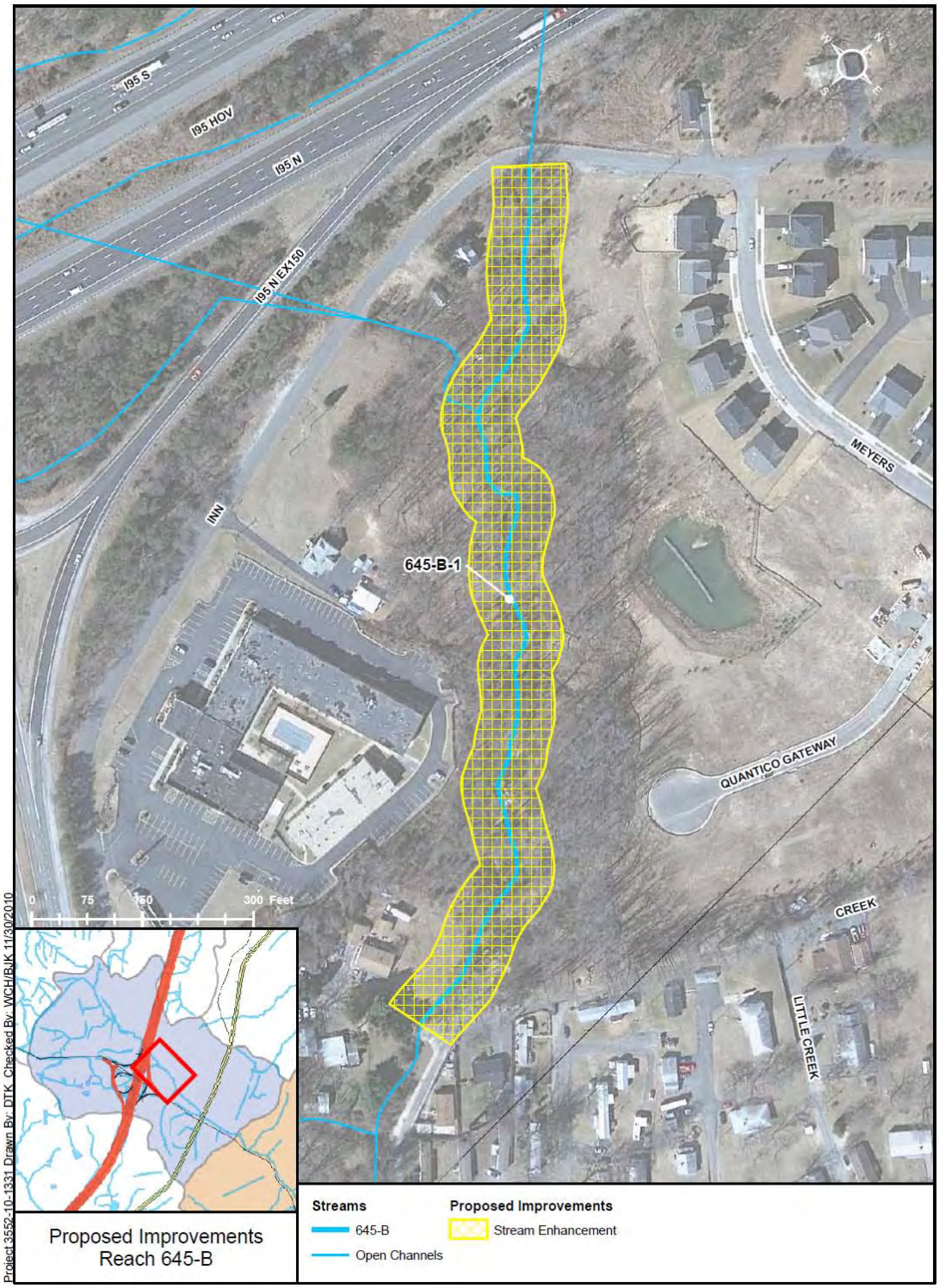
Problem Areas:

- Removal of riparian forest and encroachment on the stream corridor continues upstream of Creek Road, to the culvert at Interstate I-95, accelerating localized streambank erosion.

Recommendations:

- Enhance nearly 1300ft of degraded stream, upstream from Creek Road to the culvert at Interstate I-95, using fabric and plant bank treatment and up to 4 rock weirs or wing deflectors.


I95 S
I95 HOV
I95 N
I95 N EX 150
INN
MEYERS
QUANTICO GATEWAY
CREEK
LITTLE CREEK
0 75 150 300 Feet
Proposed Improvements
Reach 645-B
Streams
645-B
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010

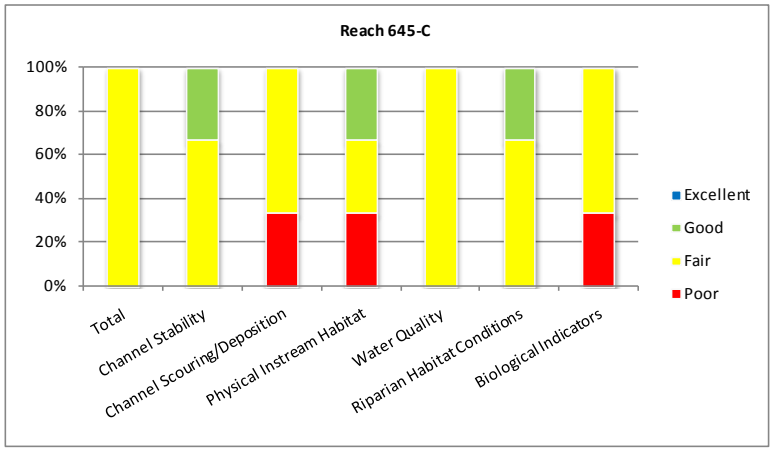

I95 S
I95 HOV
I95 N
I95 N EX150
INN
645-B-1
MEYERS
QUANTICO GATEWAY
CREEK
LITTLE CREEK
0
75
150
300 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Proposed Improvements
Reach 645-B
Streams
645-B
Open Channels
Proposed Improvements
Stream Enhancement

Reach Name: 645-C

Coordinates (NAD 83, Virginia State Plane North):
11812907.97, 6887156.79 to 11813854.71, 6886402.08

Average RSAT Score: 19

General Description:
Reach 645-C is a fair quality stream, with an average total score of 19. Reach 645-C has fair channel stability, with approximately 50% stable streambanks, and scour concentrated on the outside bends of the stream. Channel scouring/deposition and physical instream habitat scores were fair, with an increasing number of depositional features, increased embeddedness of riffle material, and few deep pools.



Riparian habitat is in fair condition, with large gaps in woody vegetation and canopy coverage. Biological indicators are poor, with only a handful of pollution tolerant species found throughout the reach. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and a depth of visibility to approximately 1.5ft.

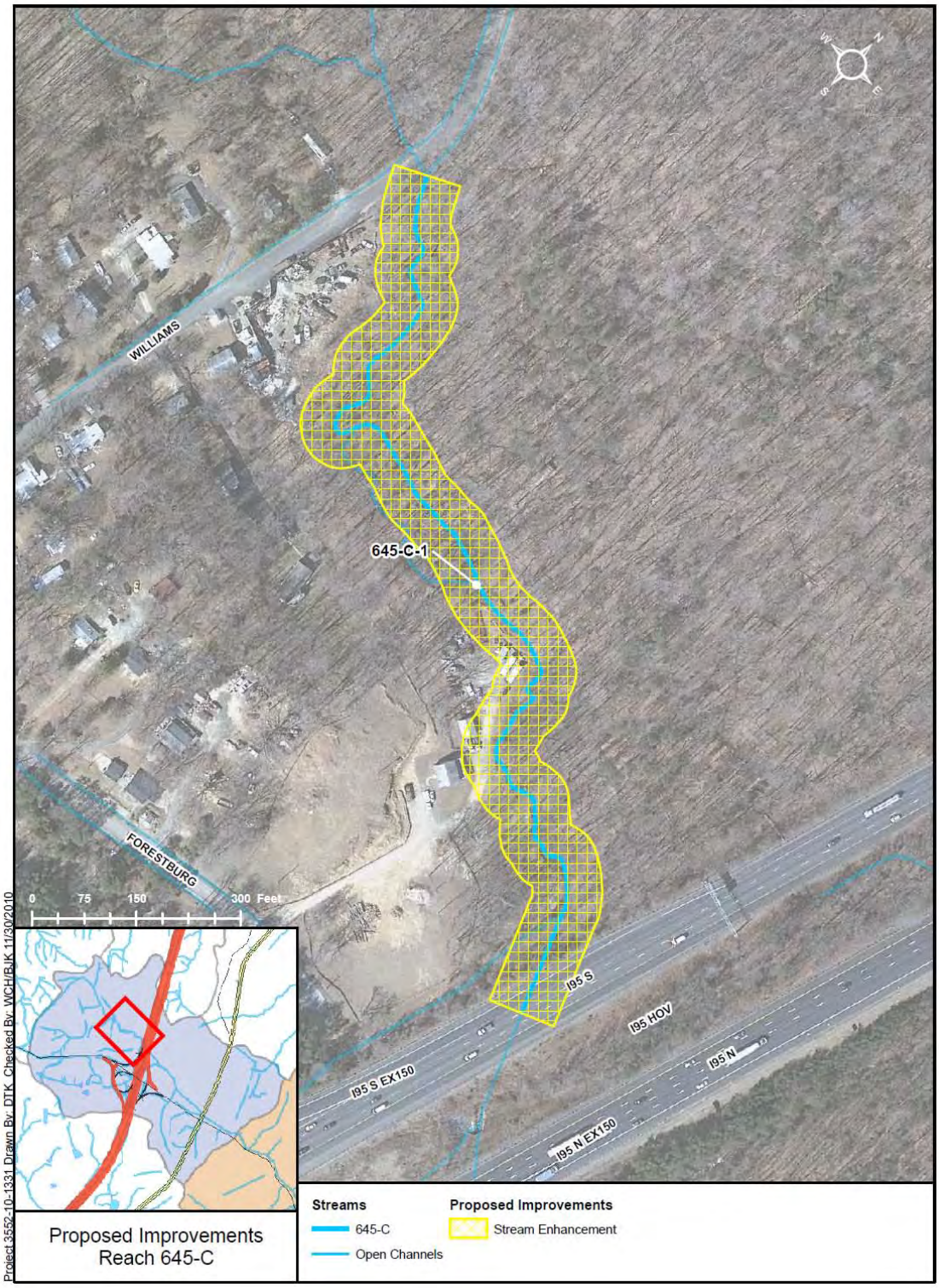
Problem Areas:

- Removal of riparian forest, followed by mowing to the top of the streambank, has left the channel susceptible to localized bank erosion and prompted mass wasting, upstream from Interstate I-95 to Williams Road.

Recommendations:

- Enhance approximately 1500ft of degraded stream, upstream from Interstate I-95 to Williams Road, using fabric and plant bank treatment and up to 5 rock weirs or wing deflectors.


WILLIAMS
FORESTBURG
0 75 150 300 Feet
I95 S
I95 HOV
I95 N
I95 S EX150
I95 N EX150
Streams
645-C
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50
Total RSAT Score by Sampling Point
Reach 645-C
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010

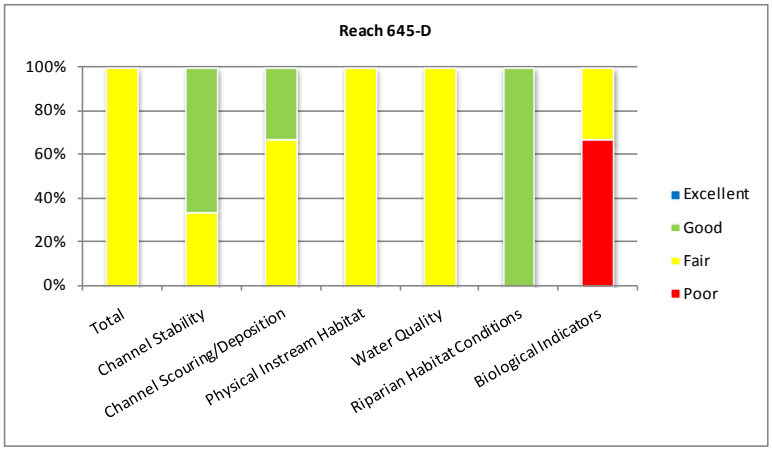

WILLIAMS
645-C-1
FORESTBURG
0 75 150 300 Feet
I95 S
I95 HOV
I95 N
I95 S EX150
I95 N EX150
Streams
645-C
Open Channels
Proposed Improvements
Stream Enhancement
Proposed Improvements
Reach 645-C
Project 3562-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010

Reach Name: 645-D

Coordinates (NAD 83, Virginia State Plane North):
11812222.93, 6888188.69 to 11812864.33, 6887168.22

Average RSAT Score: 24

General Description:
Reach 645-D is a fair quality stream, with an average total RSAT score of 24. Reach 645-D has good channel stability, with relatively stable streambanks, little bank sloughing or erosion, and resistant bed and bank materials. Channel scouring/deposition and physical instream habitat scores were fair, with an increasing number of depositional features, increased embeddedness of riffle material, and few deep pools.



Riparian habitat is in fair condition, with large gaps in woody vegetation and canopy coverage. Biological indicators are poor, with only a handful of pollution tolerant species found throughout the reach. Water quality is fair, with a moderate level of substrate fouling, increased TDS, and a depth of visibility to approximately 1ft.

Problem Areas:

- Moderate channel incision has been slowed by woody debris jams and bank stabilization provided by the existing riparian forest, from Park Entrance Road to Williams Road.

Recommendations:

- Purchase, preserve and monitor the existing riparian corridor with a permanent deed restriction or conservation easement, along nearly 1300ft of stream, from Park Entrance Road to Williams Road.


PARK ENTRANCE
WILLIAMS
0 75 150 300 Feet
Project 3552-10-1331 Drawn By: DTK Checked By: WCH/BJK 11/30/2010
Total RSAT Score by Sampling Point
Reach 645-D
Streams
645-D
Open Channels
Total RSAT Score
Poor <16
Fair 16 - 29
Good 30 - 41
Excellent 42 - 50