Appendix B
Reach Descriptions

Reach Description

Fishpot Study
Fishpot Main Stem from Station 507+50 to Station 492+50

Length: 1,500 feet
Municipality: Ballwin and Ellisville

Dominant Fluvial Process

Between Clarkson Road (Station 507+50) and Fairview Drive (Station 492+50), meander migration is the dominant channel forming process. Meander migration has been precipitated by the addition of a new modular block wall on the left descending bank at Field Avenue. Channel incision would have a greater effect on this upper portions of this reach if not for a series of exposed sanitary sewer laterals, including an exposed grouted VCP sewer line crossing upstream of the Fairview Drive bridge, acting as a *de facto* grade controls. Downstream of the grouted VCP sewer line to the Fairview Drive bridge, channel incision is the dominant process.

Soil type(s): Urban land, bottom land, Fishpot-Urban land complex with 0 to 5 percent slopes, and Elsah silt loam.

Originally stream bottomland or terraces, the Urban land, bottomland consists of areas that are now more than 85 percent covered by impervious surfaces such as concrete, asphalt, or buildings. Many of these areas are subject to localized flooding and short periods of inundation. The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex. Elsah silt loam is an excessively drained soil found in small stream bottoms and adjacent to larger stream channels. Permeability is moderately rapid and surface runoff is slow to medium. Included in this soil type are small areas of Haymond and Wilbur soils, which are less cherty than the Elsah soils.

Geomorphology

The uppermost reach of Fishpot Creek is adjusting in planform and profile through meander migration adjacent to Field Avenue and localized channel widening downstream. These adjustments in channel planform were precipitated by the addition of a new modular block wall on the left descending bank at Field Avenue, which increases stream energy due to lower hydraulic roughness and a near vertical slope. The wall ends immediately upstream of the typical high stress point in a bend with no transition or protection against the increased stream energy. The wall is now being flanked on the downstream end. On the opposite bank, riprap armoring is being flanked on the upstream end. This is an indication that the meander is attempting to migrate downstream past the armored channel. As the discharge flowline moves ahead of the channel

centerline, advancing the meander, it is eroding the bank at the upstream end of gabions and downstream end of block wall. Channel widening was observed roughly 100 to 200 feet downstream of the migrating meander.

Further downstream, the widened channel has stabilized, influenced by a series of exposed sewer laterals acting as *de facto* grade controls, including a grouted VCP sewer line crossing the channel near Fairview Drive. These *de* facto grade controls have slowed the propagation of channel incision. However, these crossings also act as flat weirs, collecting sediment and directing flow against both banks, resulting in localized channel widening. Channel incision may have been aggravated when the channel was overwidened by the construction of the new Fairview Drive bridge. As a result, a large volume of gravel and sediment liberated from upstream of the culvert was transported downstream of the new bridge, initiating a new headcut upstream of Fairview Drive.

Reach Description

Fishpot Study
Fishpot Main Stem from Station 492+50 to Station 438+50

Length: 5,400 feet
Municipality: Ballwin and Ellisville

Dominant Fluvial Process

Downstream of Fairview Drive (Station 492+50) Fishpot Creek is widening, until reaching a depositional reach through Mockingbird Park. The stream is responding to deposition and hard armor spot fixes by adjusting in planform. In some locations Reno mattress hard armoring on the channel bed has accelerated meander migration by inhibiting vertical channel adjustment. Approaching the West Skyline Drive bridge (Station 438+50), the channel has regained lateral and vertical stability.

Soil type(s): Urban land, bottom land, Fishpot-Urban land complex with 0 to 5 percent slopes, and Elsah silt loam.

Originally stream bottomland or terraces, the Urban land, bottomland consists of areas that are now more than 85 percent covered by impervious surfaces such as concrete, asphalt, or buildings. Many of these areas are subject to localized flooding and short periods of inundation. The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex. Elsah silt loam is an excessively drained soil found in small stream bottoms and adjacent to larger stream channels. Permeability is moderately rapid and surface runoff is slow to medium. Included in this soil type are small areas of Haymond and Wilbur soils, which are less cherty than the Elsah soils.

Geomorphology

At the Fairview Drive bridge, one side of the bridge opening (the left descending bank) has been filled in with debris and sediment, a common occurrence along Fishpot main stem. The stretch of stream between Fairview Drive and West Skyline Drive has been highly manipulated, with gabions and dumped riprap armoring along the stream banks and Reno mattress lining the channel bed. Extensive hard armoring of the banks and bed is not continuous, but instead appears to be the cumulative result of spot fixes, each one triggering an instability elsewhere along the reach. Downstream of the Fairview Drive bridge, an undercut and exposed sewer line marks the beginning of gabion-lining along the right descending bank. The gabions extend 150 feet downstream from the sewer line before returning to an unarmored bank, but resume downstream of a second undermined sewer line crossing. Gabions continue to alternate from bank to bank north of Highview Drive and again between Crestland and Hillsdale

Drives, down to the West Skyline Drive bridge. In some locations, south of Providence Road near Mockingbird Park, the stream has undermined the deteriorating gabions as it adjusts.

Along this segment, the effects of spot-fix hard armoring were observed immediately upstream or downstream of hard-armor treatments. For example, a blow-out along the right descending bank occurs immediately downstream of a 150 foot stretch of gabions. Immediately downstream of the gabions, near Providence Road and Monteith Drive, utility poles are threatened by advancing bank erosion. Furthermore, wire-basket gabions tend to deteriorate rapidly in urban streams. This occurs frequently in our metropolitan area because of accelerated corrosion in response to excessive road salting during winter months. Basket integrity is then aggravated by incision or downcutting of the channel bed, adding to the stress on the corrosion-weakened wires. For this reason, the life cycle costs for gabion installation and maintenance can be exorbitant.

Other hard points along this reach have similar effects on bank stability. At Station 469+00 there is an in-stream structure, very similar to a concrete weir, that has directed flow against the right descending bank, resulting in a scour hole at the toe of the bank. An exposed grouted sanitary sewer line has formed a drop in channel grade at Station 457+75. Another exposed sewer line crossing at Station 451+50 has initiated meander migration.

Station 449+00 is the beginning of Reno mattress-lined channel that extends approximately 500ft downstream to Station 444+00. A large scour pool has formed downstream of the Reno mattress channel. In addition, bank erosion around the scour pool has undermined trees, toppling them into the channel.

Between Crestland and Hillsdale Drives the channel maintains what is best described as urban-stable channel morphology down to West Skyline Drive.

Reach Description

Fishpot Study
Fishpot Main Stem from Station 438+50 to Station 409+50

Length: 2,900 feet
Municipality: Ballwin and Ellisville

Dominant Fluvial Process

Between West Skyline Drive (Station 438+50) and Smith Drive (Station 430+70), most of the channel is stable in both planform and profile, with localized meander migration approaching the Smith Drive culvert. Downstream of the Smith Drive culvert the stream has been channelized with vegetated gabions and Reno mattress along both banks. However, the channel maintains stability through what is primarily a depositional reach, downstream to Manchester Road (Station 409+50).

Soil type(s): Urban land, bottom land, Fishpot-Urban land complex with 0 to 5 percent slopes, and Elsah silt loam.

Originally stream bottom land or terraces, the Urban land, bottom land consists of areas that are now more than 85 percent covered by impervious surfaces such as concrete, asphalt, or buildings. Many of these areas are subject to localized flooding and short periods of inundation. The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex. Elsah silt loam is an excessively drained soil found in small stream bottoms and adjacent to larger stream channels. Permeability is moderately rapid and surface runoff is slow to medium. Included in this soil type are small areas of Haymond and Wilbur soils, which are less cherty than the Elsah soils.

Geomorphology

Between West Skyline Drive and Smith Drive the channel is generally stable, with competent sediment transport. Despite overbank dumping of concrete slabs and cinder blocks along the right descending bank, behind homes along Vlasis Drive, the channel remains well-vegetated and stable in cross-section.
Directly south of the East Skyline Drive cul-de-sac, sediment transport diminishes as the slope flattens near the confluence with a small, unnamed tributary. Deposition of gravel and cobbles has occurred near the confluence, but only 200 feet downstream of this confluence, the Smith Drive culvert is relatively free of depositional material.

Downstream of the Smith Drive culvert the stream has been channelized with now vegetated gabions and Reno mattress. Overall, the channel maintains vertical and lateral stability through what is primarily a sediment transport reach.

Two exposed sewer lines cross the channel along this reach near Applegate Lane, approaching Manchester Road. Between these two sewer lines a small, unnamed tributary with a Reno mattress channel bed enters from the left descending bank. A concrete structure in the stream is acting as a turning weir, concentrating flow against the left descending bank behind residential property on Applegate Lane.

Approaching Manchester Road the channel bed slope is locally reduced, prompting deposition immediately upstream of the double box culvert.

Reach Description

Fishpot Study
Fishpot Main Stem from Station 409+50 to Station 388+00

Length: 2,150 feet
Municipality: Manchester and Ballwin

Dominant Fluvial Process

Between Manchester Road (Station 409+50) and Old Ballwin (Station 398+50) the channel is a stable transport reach with bedrock control. Between Old Ballwin Road and Ramsey Lane (Station 388+00) overbank dumping has aggravated meander migration behind the Ballwin Nursery.

Soil type(s): Fishpot-Urban land complex with 0 to 5 percent slopes and Urban land, bottom land.

The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex. Originally stream bottom land or terraces, the Urban land, bottom land consists of areas that are now more than 85 percent covered by impervious surfaces such as concrete, asphalt, or buildings. Many of these areas are subject to localized flooding and short periods of inundation.

Geomorphology

The reach of Fishpot Creek between Manchester Road and Old Ballwin Road can be classified as a stable, transport reach. Downstream of Manchester Road, the channel bed is exposed limestone bedrock, with a three to four foot behind Barton Lane. Downstream of the knick point the channel is lined with exposed limestone bedrock in the channel bed and along both banks. The prevalence of bedrock has limited vertical and lateral channel adjustment through this reach. Although the occurrence of bedrock outcrops decreases approaching Old Ballwin Drive, the channel remains stable.

Downstream of Old Ballwin Road there is substantial overbank dumping of wood chips, plant buckets, pallets, mulch and other material along 500 to 600 feet of the right descending bank behind the Ballwin Nursery. The overbank dumping has created a local channel constriction that has induced lateral channel migration, compromising bank stability behind commercial property on both sides of the channel. Downstream of the dumping an exposed, grout-encased sanitary sewer line acts as a *de facto* grade control, approximately 200 feet upstream of the Ramsey Lane culvert.

At the Ramsey Lane triple box culvert, at Station 387+50, the culvert barrel along the left descending bank has been filled in with gravel and sediment, an indication that the culvert had originally locally overwidened the channel.

Reach Description

Fishpot Study
Fishpot Main Stem from Station 388+00 to Station 354+50

Length: 3,500 feet
Municipality: Manchester and Ballwin

Dominant Fluvial Process

This reach of upper Fishpot Creek, between Ramsey Lane (Station 388+00) and Reis Road (Station 354+50) is predominantly a stable reach, but widening near Reis Road. Channel widening is driven primarily by coarse gravel and cobble deposition downstream of Essen Lane.

Soil type(s): Fishpot-Urban land complex with 0 to 5 percent slopes and Urban land, bottom land.

The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex. Originally stream bottom land or terraces, the Urban land, bottom land consists of areas that are now more than 85 percent covered by impervious surfaces such as concrete, asphalt, or buildings. Many of these areas are subject to localized flooding and short periods of inundation.

Geomorphology

Overbank flooding is the major complaint from residents along this reach of Fishpot Creek. The double box culvert under Ramsey Lane has induced flooding due to inadequate hydraulic conveyance, resulting from two obstacles at the culvert. First, the right descending barrel under Ramsey Lane is blocked by a vegetated sediment bar, hindering hydraulic conveyance through the culvert. Second, the bottom of the culvert is too high, which also reduces hydraulic conveyance. Downstream of Ramsey Lane, near Station 385+00, an exposed sewer line crossing and grouted riprap armoring the pipe on both banks has constricted the channel. This channel constriction is also responsible, in part, for localized flooding in the vicinity of Ramsey Lane.

The channel is adjusting laterally by means of meander migration behind homes on Ramsey Lane, directly north of Vail Court. The channel regains stability in planform and profile through a bedrock-controlled reach downstream of Vail. The channel is relatively straight with low sloping banks. However, downstream of a knick point in chert bedrock, directly south of the end of Essen Lane, bank erosion induced by downstream channel migration resumes.

Approaching Reis Road, meander migration diminishes, but the stream continues to adjust laterally through channel widening. Coarse sediment deposition

upstream of the Reis Road culvert has triggered channel widening. Deposition is occurring in response to several hydraulic obstacles. The first is an exposed and undermined 24 inch sewer line crossing approximately 650 feet upstream of Reis Road (Station 361+00), behind Covert Court. In addition, the existing quadruple box culvert under Reis Road is poorly aligned and perched above the channel bed. This not only affects sediment transport, but it influences flood frequency in the vicinity of the culvert, as well.

Reach Description

Fishpot Study
Fishpot Main Stem from Station 354+50 to Station 297+50

Length: 5,700 feet
Municipality: Manchester and Ballwin

Dominant Fluvial Process

In general, the reach between Reis Road (Station 354+50) and Lindy Drive (Station 316+50) is vertically and laterally stable. An exception occurs where localized bank erosion and meander migration has been induced by a short gabion-lined reach south of Brookside Lane.

Deposition has resulted from a locally flattened bed slope under the Lindy Drive bridge. However, competent transport resumes through the concrete channel north of Jamboree Drive, before reaching a widened section of channel upstream of the new Sulphur Springs Road bridge (Station 297+50).

It should be noted that Sulphur Springs Road was re-aligned and a new bridge over Fishpot Creek was being constructed as field analysis for this project progressed. An existing three foot knick point at the old Sulphur Springs Road crossing was identified at the beginning of this analysis. The knick point may not have been adequately addressed by the construction of a trapezoidal rock-lined approach to the new Sulphur Springs Road Bridge. If the transition is inadequate, there is a possibility that the new construction could generate channel incision upstream of the rock-lined channel.

Soil type(s): Fishpot-Urban land complex with 0 to 5 percent slopes and Urban land, bottom land.

The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex. Originally stream bottom land or terraces, the Urban land, bottom land consists of areas that are now more than 85 percent covered by impervious surfaces such as concrete, asphalt, or buildings. Many of these areas are subject to localized flooding and short periods of inundation.

Geomorphology

Immediately downstream of the perched Reis Road bridge, there is a two foot drop in the rip rap-lined channel. The bed material is primarily small, flat and elongated riprap that extends 25 feet downstream from the Reis Road bridge, with a maximum particle size of 18 inches. The channel maintains a straight course, with an average bank height of five feet.

Nearly 150 feet downstream of Reis Road, local bank scouring has undermined the cherty clay bank material along the right descending bank, killing several streamside trees. Limestone bedrock outcrops along the right descending bank become more prevalent, advancing downstream from Reis Road.

Localized bank erosion begins at a riprap armored CMP outfall on the left descending bank behind homes on Brookside Lane, directly south of Lark Hill Lane. A bank failure along this bank has created a *de facto* weir across the channel, which directs flow back against the bank, exacerbating erosion. About 50 feet downstream from this localized failure, a bankfull floodplain has formed on the right descending bank behind Barker Lane. A ravine enters the main channel from this bankfull floodplain. In response, the channel thalweg has shifted towards the opposite bank. Limestone bedrock is exposed in the channel bed, ending where the channel makes a left-hand turn farther downstream.

A section of gabion-lined channel begins behind Brookside Lane, south of the intersection with Robin Hill Lane. Coarse bed material has formed a point bar along the right descending bank and a large volume of construction sand and fine sediment is contributed to the bed material of the gabion-lined reach, entering from a tributary on the right descending bank. However, this reach is stable and competently transporting sediment, until reaching the end of the channelized section, where deposition has induced meander migration south of Brookside Lane. Meander migration has resulted in advancing bank erosion along the right descending bank, behind homes on Towercliff Drive and Treasure Cove.

Through this depositional reach, bed material is primarily fine aggregate material, ranging in particle size from one to eight inches. It appears that MSD maintenance has continually pushed the aggregate onto the right descending bank in an effort to keep the channel open. This type of channel maintenance offers only temporary relief to channel flooding. Eventually, material is re-deposited in the channel, raising the channel bed.

Near Station 326+00, an aerial sanitary sewer line crossing inhibits hydraulic conveyance. Downstream of this sewer line crossing, a concrete facing begins along the left descending bank. A bar of fine sediment extends from the left descending bank over to the right descending bank, indicative of accelerated flow along the concrete of the left bank and slower flow along the right bank. The concrete facing is the beginning of a concrete channel with natural bed material, which continues down to the Lindy Drive bridge.

Continued maintenance of the concrete facing is necessary to prevent deterioration. Life-cycle costs for concrete channel walls can be extremely high. A section of newly poured concrete, downstream of a meander curve between Roland Avenue and Treasure Cove, is evidence of ongoing bank maintenance through this reach.

The concrete channel continues underneath Lindy Drive and ends near Chappel Court. A constriction in the channel at the Lindy Drive bridge likely contributes to upstream flooding. A decrease in bed slope under the Lindy Drive bridge has induced deposition. Downstream of the Lindy Drive bridge point bars extending from both banks act as a pool-riffle sequence through the concrete-lined reach. Approximately 600 feet to 700 feet downstream of Lindy Drive, the bank height drops to about four feet on the left descending bank and five feet on the right descending bank. The bed material at this location is flat and elongated rock, up to eight inches in diameter with fine gravel. Minor imbrication of bed materials was observed throughout this reach.

Near the end of the concrete channel, an aerial sanitary sewer line is severely corroded, with several small holes and metal patches from past repairs. Downstream of the sanitary sewer line there is a three to four foot drop into a scour pool at the end of the concrete channel. The channel widens to approximately 45 feet and coarse gravel has accumulated in channel bed, along with discarded concrete slabs from past sanitary sewer repairs. Well-polished chunks of concrete are mixed in with bed materials, extending 150 to 250 feet downstream from the end of the concrete channel. Overbank dumping is extensive approaching Sulphur Springs Road, particularly along the right descending bank.

Reach Description

Fishpot Study
Fishpot Main Stem from Station 297+50 to Station 267+50

Length: 3,000 feet
Municipality: South County

Dominant Fluvial Process

The reach of Fishpot Creek between Sulphur Springs Road (Station 297+50) and Wren Avenue (Station 267+50) is a vertically stable reach, but influenced largely by planform adjustment through channel widening. Much of the reach between Sulphur Springs Road and Wren Avenue is depositional in nature. Mobile gravel in channel bars direct water and fine sediment flow toward the banks during flood events. Steep, undercut banks and scour holes increase approaching Wren Avenue, accompanied by mobile sediment bars.

Soil type(s): Elsah silt loam, Freeburg silt loam, and Fishpot-Urban land complex with 0 to 5 percent slopes.

Elsah silt loam is an excessively drained soil found in small stream bottoms and adjacent to larger stream channels. Permeability is moderately rapid and surface runoff is slow to medium. Included in this soil type are small areas of Haymond and Wilbur soils, which are less cherty than the Elsah soils. Freeburg silt loam is a nearly level, poorly drained soil found on stream terraces throughout St. Louis County, particularly in old stream valleys in the Meramec River drainage system. Permeability is moderately slow and surface runoff is slow. The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex.

Geomorphology

Downstream of the new Sulphur Springs Road bridge, the stream has established meanders through exposed limestone bedrock. Base flow channel width varies between 34 and 44 feet. Bank height gradually increases from 11 feet to 14 feet along the left descending bank and six feet to 30 feet along the right descending bank through the first 1,000 feet downstream of Sulphur Springs Road. Although the right descending bank is nearly 30 feet tall and steep, the channel is stable in cross section. The stream remains stable in both planform and profile, before making a transition to a gravel and cobble channel bed with eroding banks influenced by channel widening. Bank heights decrease dramatically, with the left descending bank measured at nine feet and the right descending bank dropping to five feet.

Approaching Wren Avenue, the left descending bank is a near vertical and undercut bank, composed of loess soil over cherty residuum. A scour hole has

formed immediately downstream of this high bank. A recent wedge failure, roughly 500 feet upstream from Wren Avenue, has generated large volumes of soil liberated from the eroding bank. Silt and sediment from eroding banks has been deposited downstream behind a 24 inch diameter tree that has toppled into the channel from the right descending bank, acting as a turning vane. At Wren Avenue, two of the three barrels at the bridge have been blocked with large woody debris, liberated from failing banks upstream of the bridge.

Reach Description

Fishpot Study
Fishpot Main Stem from Station 267+50 to Station 230+50

Length: 3,700 feet
Municipality: South County

Dominant Fluvial Process

The reach of Fishpot Creek between Wren Avenue (Station 267+50) and Big Bend Woods (Station 230+50) is primarily a stable, transport reach. From the Bromfield Tributary downstream to Big Bend Road the stream is depositional. Channel widening immediately upstream of Big Bend Woods and localized meander migration upstream of Big Bend Road are exceptions to an otherwise stable reach. Gravel and cobble deposition, responsible for localized channel adjustment and bank erosion along this reach, is strongly influenced by road crossings and a grout-encased sanitary sewer line upstream of the Bromfield Tributary confluence.

Soil type(s): Elsah silt loam, Freeburg silt loam, and Fishpot-Urban land complex with 0 to 5 percent slopes.

Elsah silt loam is an excessively drained soil found in small stream bottoms and adjacent to larger stream channels. Permeability is moderately rapid and surface runoff is slow to medium. Included in this soil type are small areas of Haymond and Wilbur soils, which are less cherty than the Elsah soils. Freeburg silt loam is a nearly level, poorly drained soil found on stream terraces throughout St. Louis County, particularly in old stream valleys in the Meramec River drainage system. Permeability is moderately slow and surface runoff is slow. The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex.

Geomorphology

On the downstream side of the Wren Avenue culvert, the left descending bank is actively eroding. A large scour hole has formed at the end of the concrete culvert downstream of the left descending barrel of the bridge, and has self-armored with large chunks of deposited limestone and grouted riprap. Downstream of the scour hole limestone bedrock outcrops line the right descending bank and part of the channel bed, and the channel narrows, measuring only 34 feet at the top of bank. Bed material alternates between small cobbles and well-sorted chert gravel. Both banks are well-vegetated.

Approaching Big Bend Woods, channel bed slope flattens considerably. Coarse bed material and introduced limestone riprap has been deposited immediately

upstream of the culvert. Localized channel widening has increased channel width to 55 feet at the top of bank.

Downstream of Big Bend Woods, scour along the left descending bank has resulted from a misaligned triple box culvert under the road. However, the bank erosion at this site has since been addressed as part of a sanitary sewer line repair. The bank is now stabilized with a composite revetment and rock toe. Bedrock outcrops along the right descending bank extend approximately 200 feet downstream from the Big Bend Woods culvert.

Upstream of confluence with Bromfield Tributary, a grouted sewer line crossing acts as a significant *de facto* grade control. From the top of the sewer line to the bottom of the scour pool downstream, there is a nine foot drop in channel bed elevation. Channel bed elevation increases as the scour pool tapers off downstream, but overall, the grouted sewer line represents a dramatic four foot change in channel bed elevation. From the confluence with Bromfield Tributary, downstream to Big Bend Road, the stream is depositional with chert gravel bed material and small cobbles.

Reach Description

Fishpot Study
Fishpot Main Stem from Station 230+50 to Station 190+00

Length: 4,050 feet
Municipality: South County

Dominant Fluvial Process
The reach of Fishpot Creek between Big Bend Road (Station 230+50) and Holly Green Tributary (Station 190+00) is primarily a transport reach with deposition increasing in the vicinity of Westbrooke Terrace Drive. This reach of Fishpot Creek is characterized by a decrease in average bed slope and an alternating bed sequence of coarse bed material and fine bed material, typical of much of the Lower Fishpot sediment regime.

Meander advance west of Westbrooke Terrace Drive and Stratford Ridge Drive appears to be in response to past dumping and filling activity along the left descending bank, which may have reset the existing meander pattern, thus initiating the lateral channel migration.

Soil type(s): Elsah silt loam, Freeburg silt loam, and Fishpot-Urban land complex with 0 to percent slopes.

Elsah silt loam is an excessively drained soil found in small stream bottoms and adjacent to larger stream channels. Permeability is moderately rapid and surface runoff is slow to medium. Included in this soil type are small areas of Haymond and Wilbur soils, which are less cherty than the Elsah soils. Freeburg silt loam is a nearly level, poorly drained soil found on stream terraces throughout St. Louis County, particularly in old stream valleys in the Meramec River drainage system. Permeability is moderately slow and surface runoff is slow. The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex.

Geomorphology
At the upstream end of this reach, a deep scour pool, spanning nearly the entire width of the channel (55 feet), acts as a collecting basin for large chunks of plucked limestone and grouted riprap downstream of the Big Bend Road culvert. The flat, gravel and cobble channel morphology starts 150 to 200 feet downstream of Big Bend Road. Bank heights average 10 feet on both the left descending and right descending banks. Chert and limestone bedrock outcrops are primarily along the right descending bank.

Farther downstream, across from a modular block retaining wall behind the tennis courts on Westbrooke Terrace Drive, a wide advancing point bar along the

right descending bank is the result of a grouted sewer line downstream acting as a *de facto* grade control. This is the upstream end of a reach that is adjusting in planform by means of meander migration. Roughly 200 feet downstream of the grouted sewer line crossing there is an advancing high bank behind Westbrooke Terrace Drive, the result of lateral channel adjustment. The bank is loess soil, with a layer of construction rubble and fill material on top. Groundwater is forced out at the contact between these layers because the loess has been compacted at the surface. The combination of groundwater seepage near the top of the bank and an actively eroding bank toe has led to the advancing bank failure. Approximately 500 feet downstream, another tall, shear bank is actively eroding as the result of meander migration in the vicinity of Stratford Ridge Drive. This bank is composed of a layer of loess soil, over residuum, on top of limestone bedrock.

Behind Oak Springs Trail a sanitary overflow flap-valve is jammed open on the right descending bank. This open sanitary overflow poses a significant threat to human health and should be repaired immediately. Downstream of the open flap-valve, the channel bed is polished limestone with bedrock exposed along both banks, as well.

The channel is stable in planform and profile downstream of the sanitary overflow, with a wide riparian corridor down to the confluence with Holly Green Tributary.

Reach Description

Fishpot Study
Fishpot Main Stem from Station 190+00 to Station 111+00

Length: 7,900 feet
Municipality: Valley Park and South County

Dominant Fluvial Process

The reach of Fishpot Creek that stretches from Holly Green Tributary (Station 190+00) to Hanna Road (Station 111+00) is largely depositional, with a short transport reach southwest of Daybreak Point Court and northeast of Stoney Terrace Drive. Aggradation of coarse bed materials, a low bed slope, and upstream interventions have initiated lateral channel migration near Vance Road and Pepperdine Court. This has resulted in an advancing cutbank, which is rapidly eroding and threatening residential property along Pepperdine Court.

Soil type(s): Elsah silt loam and Haymond silt loam

Elsah silt loam is an excessively drained soil found in small stream bottoms and adjacent to larger stream channels. Permeability is moderately rapid and surface runoff is slow to medium. Included in this soil type are small areas of Haymond soils, which are less cherty than the Elsah soils. Haymond silt loam is a well-drained soil occurring in small stream bottoms and adjacent to larger streams. This soil has a moderate permeability and surface runoff is very slow. Areas in which Haymond silt loam occurs are subject to frequent flooding.

Geomorphology

Downstream of the confluence with Holly Green Tributary the bankfull channel is 55 feet wide, with a top of bank width of 65 feet. Both banks are well-vegetated, with bank heights of 10 to 12 feet high.

The channel has been artificially widened near Station 170+00, sometime during or after the construction of new houses off of Sulphur Springs Road, north of Stoney Terrace Drive. Past field observations revealed in-channel grading, along with the excavation of gravel bed material, significantly altering channel form and function. Downstream of Station 170+00, the stream has a naturally flat channel bed of well-sorted bed material with bedrock outcrops alternating along both banks. Bedrock control diminishes approaching Station 155+00, behind Pepperdine Court.

Bank erosion is threatening a section of Vance Road and five homes along Pepperdine Court. Deposition has prompted plan form adjustment of the channel. From analysis of the moving average slope it is apparent that the effective channel slope drops to zero through this reach. The large bed load and lack of stream power to move the bed load drives the stream to meander as it drops the chert cobble and subsequently scours the loess and clay banks.

Advancing erosion has resulted in a bare, vertical bank face that spans roughly 200 feet of channel length along the right descending bank.

Meander migration continues downstream to Carriage Bridge Trails, before widening between Wooden Bridge Trail and Glenn Brooke Woods Circle. Young sycamores and woody vegetation have colonized the gravel bars through this widened reach, indicating the earliest stages of recovery. Proceeding downstream, the channel is stable and depositional down to Hanna Road bridge.

Reach Description

Fishpot Study
Fishpot Main Stem from Station 111+00 to Station 0+00

Length: 11,100 feet
Municipality: Valley Park

Dominant Fluvial Process

The lowermost reach of Fishpot Creek is shaped by deposition, which has lowered the channel bed gradient and induced widening and channel meandering through the well-sorted gravel and cobble bed material. Sediment transport and deposition throughout this reach is largely influenced by the effects of backwater from Meramec River flooding. Stream flow and deposition can be drastically altered depending on the Meramec River flood elevation. Although the reach is vertically stable, meander migration has resulted in localized bank instability and erosion between the low-water crossing downstream of Hanna Road and Vance Road.

Soil Type(s): Wilbur silt loam and Haymond silt loam

Wilbur silt loam is a nearly level, moderately well drained soil found in small stream bottoms. This frequently flooded soil is moderately permeable, and surface runoff is slow. A seasonal water table can be expected at a depth of three feet or more during the winter and spring months. Haymond silt loam is a well-drained soil occurring in small stream bottoms and adjacent to larger streams. This soil has a moderate permeability and surface runoff is very slow. Areas in which Haymond silt loam occurs are subject to frequent flooding.

Geomorphology

Downstream of Hanna Road, Fishpot Creek is approximately 65 feet wide and depositional. Meander migration is the dominant fluvial process between Hanna Road and a low water crossing downstream. The low water crossing downstream of Hanna Road provides access to a Valley Park public park, but has virtually no sediment transport capacity. This has induced sediment deposition and accelerated lateral migration from the low water crossing upstream to Hanna Road. The low water crossing has significantly destabilized this reach and must be removed. New limestone rip rap, approximately eight to 10 inches, has been dumped upstream of the low water crossing on two eroding banks in need of repair. While riprap armoring has been a common response to bank failures along this reach of Lower Fishpot, it is rarely effective at preventing systemic bank failures and often amplifies damage by erosion.

The channel narrows to 45 feet downstream of the low water crossing with bedrock outcrops along the left descending bank. The Valley Park Tributary joins Fishpot Main Stem approximately 700 feet downstream of the low water crossing. From the Valley Park Tributary downstream to Vance Road the channel is vertically stable with a tendency toward channel widening or meander

migration, influenced by sediment supply, low bed slope, and Meramec River backwater. The reach is relatively undeveloped and well-vegetated. Several natural springs were observed through rock outcroppings along the left descending bank towards the downstream limits of this reach. The high cutbanks observed between the Valley Park Tributary confluence and Vance Road do not appear to threaten existing buildings or infrastructure.

Reach Description

Fishpot Tributary Study
Valley Park Tributary (**SSMIP Branch A**)

Length: 5,000 feet
Location: From Hwy 141, southwest to confluence with Fishpot Creek main stem

Dominant Fluvial Process

Similar to many of the tributaries in the Fishpot Creek Watershed, the Valley Park Tributary is adjusting by means of channel incision. From the Crescent Road bridge to the confluence with Fishpot Creek main stem, the stream is actively incising or recovering from past channel incision. The stream has incised up to the Crescent Road Bridge (Station 30+00), where a knick point in exposed bedrock, nearly six feet tall, has been identified immediately downstream of the bridge. The height of this knick point is an indication of the severity of past channel incision, but the upstream propagation of incision has been temporarily halted at this geologic control point.

Soil Type(s): Haymond silt loam, Urban land-Harvester complex with 2-9 percent slopes, and Menfro silt loam with 9 to 14 percent slopes.

Haymond silt loam is a well-drained soil occurring in small stream bottoms and adjacent to larger streams. This soil has a moderate permeability and surface runoff is very slow. Areas in which Haymond silt loam occurs are subject to frequent flooding. The Urban land-Harvester soil complex is a mix of paved Urban land and gently sloping, moderately well-drained Harvester soils. The Urban part of the soil complex is covered by streets, parking lots, or buildings, and is, therefore, impervious to water. Harvester soils, in yards, between buildings, parks, and undeveloped areas, have moderate permeability. This soil complex results in moderate to low permeability with rapid stormwater runoff. Menfro silt loam is a well-drained soil that occurs on side slopes along small drainageways and on narrow ridgetops. Permeability is moderate and surface runoff is rapid.

Geomorphology

Presently, the Valley Park Tributary has incised up to a knick point downstream of the Crescent Road Bridge. The knick point is nearly six feet tall in exposed limestone bedrock. Grouted riprap lining the stream banks in the vicinity of the debris jam is failing since the stream is incising and undermined the riprap. Downstream of a second bedrock knick point, the channel widens through a depositional reach, with base flow width increasing from eight feet to 15 feet. Tall, cutbanks have reached critical bank height along this reach, threatening the backyards of homes along Crescent Valley Court. While a bank failure is eminent, it is unclear when the failure will occur. Approximately 300 feet downstream of the Crescent Road bridge there is a large debris jam acting as a *de facto* grade control.

The channel is depositional through the lower 300 feet of the tributary, upstream of the confluence with Fishpot Creek main stem. The lower reach of the Valley Park Tributary is a sinuous channel with alternating scoured banks. All geomorphic indicators suggest that the channel has completed a stage of past channel incision and is now adjusting in planform by meander migration.

Reach Description

Fishpot Tributary Study

Holly Green Tributary (**SSMIP Branch B1 and Branch B, downstream of Big Bend Rd**)

Length: 10,000 feet

Location: From a culvert and detention basin near Holly Green Drive, southeast to the confluence with Fishpot Creek main stem, at Sulphur Springs Road

Dominant Fluvial Process

Holly Green Tributary is an actively incising stream, with several sizeable knick points downstream of Brightfield Drive, with the tallest bedrock knick point standing nearly 3ft high. Bedrock outcrops along the channel bed have slowed the progress of channel incision. However, bedrock plucking continues to deepen the channel resulting in a large volume of lag material deposited upstream and downstream of the Big Bend Road culvert.

Downstream of Big Bend Road, Holly Green Tributary is widening during high flows. Approaching the Sulphur Springs Road bridge, the channel is generally stable, with the exception of localized meander migration.

Soil Type(s): Elsah silt loam, Haymond silt loam, Ashton silt loam, Menfro silt loam with 14 to 20 percent slopes, Winfield silt loam with 9 to 14 percent slopes, and Urban land-Harvester complex with 9 to 20 percent slopes.

Elsah silt loam is an excessively drained soil found in small stream bottoms and adjacent to larger stream channels. Permeability is moderately rapid and surface runoff is slow to medium. Included in this soil type are small areas of Haymond soils, which are less cherty than the Elsah soils. Haymond silt loam is a well-drained soil that also occurs in small stream bottoms and adjacent to larger streams. This soil has a moderate permeability and surface runoff is very slow. Areas in which both Elsah and Haymond silt loams occur are subject to frequent flooding. Ashton silt loam is a nearly level, well-drained soil found in low stream terraces. Permeability is moderate and surface runoff is slow. This soil type is commonly used for cultivated crops, but is generally unsuitable for building because of occasional flooding. Menfro silt loam with 14 to 20 percent slopes is a moderately steep, well-drained soil found on side slopes along streams. Permeability is moderate and surface runoff is rapid. Winfield silt loam with 9 to 14 percent slopes is a strongly sloping, moderately well-drained soil. Permeability is moderate and surface runoff is rapid. The Urban land-Harvester soil complex with 9 to 20 percent slopes is a mix of paved Urban land and strongly sloping, moderately well-drained Harvester soils. The Urban part of the soil complex is covered by streets, parking lots, or buildings, and is, therefore, impervious to water. Harvester soils, in yards, between buildings, parks, and

undeveloped areas, have moderate permeability. This soil complex results in moderate to low permeability with rapid stormwater runoff.

Geomorphology

The Holly Green Tributary originates from a culvert and detention basin north of Holly Garden Court. Downstream of the Holly Garden Court crossing, there is a section of concrete channel that is collapsing, with an exposed 10 inch sewer line exposed and undermined 50 feet downstream in the channel bed. Nearby, a telephone line has been exposed in the stream bank. Channel incision, followed by widening, is responsible for bank erosion through this reach.

Channel widening was instigated by an interruption in sediment transport at the Cleta Court crossing. Larger bed materials are trapped upstream of Cleta Court, thus locally increasing the average size of bed material, leading to an increase on overall channel width. Downstream of Cleta Court the channel has been artificially overwidened in the past, promoting sedimentation and, eventually, revegetation.

After passing through a culvert and emerging downstream of Brightfield Drive, the stream shows evidence of past channel incision. Immediately downstream of Brightfield Drive, grouted riprap lining the channel is failing, giving way to a 3ft deep scour pool. Reno mattress and gabion armoring on the banks and channel bed upstream are also threatened by continuing erosion and show signs of impending failure. There are several knick points downstream of Brightfield Drive, with the tallest knick point standing nearly three feet high. However, these knick points are remnants of past channel incision, which has largely subsided.

Upstream of the confluence with the New Ballwin Tributary (Montgomery Watson - Branch B), there are two exposed sewer lines crossing the channel. Also, the left descending bank is eroding behind the homes along Hollyberry Drive. Active bank erosion at this location is due mainly to the absence of woody vegetation at the top of the bank and the poor health of the remaining riparian corridor. Property owners neighboring this reach of stream have mowed the top of the bank to the very edge of the stream, preventing the establishment of riparian species and bank stabilization by woody vegetation.

Much of the Holly Green Tributary, upstream of Big Bend Road, flows over exposed bedrock. Bedrock plucking has resulted in a large volume of lag material upstream and downstream of the Big Bend Road culvert. Downstream of Big Bend Road the channel widens. Bedrock control of the channel continues, although the influence of channel incision is evident. Two of the knick points have been carved out of the in-stream bedrock, the first standing 5ft high and the second is nearly 7ft high. Evidence of incision continues downstream, but diminishes approaching a high bank behind Cascade Terrace Drive.

Widening continues approaching Sulphur Springs Road, until narrowing upstream of a *de facto* grade control immediately upstream of the bridge. An exposed sanitary sewer line at this location has maintained the existing channel grade. Holly Green Tributary meets the Fishpot Creek main stem downstream of Sulphur Springs Road.

Reach Description

Fishpot Tributary Study
Old Ballwin Tributary

Length: 7,000 feet
Location: From Old Ballwin Road, southeast to the confluence with Holly Green Tributary near Big Bend Road

Dominant Fluvial Process

Old Ballwin Tributary is an actively incising stream. The channel has been locally widened at the bridge under Talbert Court, which has induced channel incision upstream. Similar to the Holly Green Tributary, channel incision continues through bedrock-controlled reaches by bedrock plucking. The channel appears to have recovered from incision and stabilized downstream of Twigwood Drive.

Soil Type(s): Haymond silt loam, Urban land-Goss complex with 9 to 20 percent slopes, Urban land-Harvester complex with 9 to 20 percent slopes, and Urban land-Harvester complex with 2 to 9 percent slopes.

Haymond silt loam is a well-drained soil occurring in small stream bottoms and adjacent to larger streams. This soil has a moderate permeability and surface runoff is very slow. Areas in which Haymond silt loam occurs are subject to frequent flooding. The Urban land-Goss complex with 9 to 20 percent slopes consists of Urban land and intermingled areas of strongly sloping, well-drained Goss soils. The Urban part of the soil complex is covered by streets, parking lots, or buildings, and is, therefore, impervious to water. Permeability is moderate in Goss soils, and surface runoff is rapid to very rapid in this soil complex. The Urban land-Harvester soil complex is a mix of paved Urban land and moderately well-drained Harvester soils. Like the Urban land-Goss complex, the Urban land is covered by streets, parking lots, or buildings, and is impervious to water. Harvester soils, in yards, between buildings, parks, and undeveloped areas, have moderate permeability. This soil complex results in moderate to low permeability with rapid stormwater runoff.

Geomorphology

Old Ballwin Tributary begins at a culvert outfall under Old Ballwin Road. The stream flows to the southeast, passing under Talbert Court, Twigwood, and Mark Wesley Lane before reaching Reis Road. The channel has been locally widened at the bridge under Talbert Court. The smooth concrete channel and lower potential head accelerates water under Talbert Court, propagating channel incision upstream. Bedrock plucking has accompanied the upstream progression of incision.

Evidence of past channel incision was also observed upstream of Reis Road, but the channel appears to have since stabilized laterally and vertically.

Dunes and point bars begin to appear as the tributary approaches its confluence with Holly Green Tributary, evidence of a much flatter channel slope and a depositional nature. Old Ballwin Tributary empties into Holly Green Tributary upstream of Big Bend Road.

Reach Description

Fishpot Tributary Study
New Ballwin Tributary (**SSMIP Branch B, upstream of Big Bend**)

Length: 6,000 feet
Location: New Ballwin Road, southeast to the confluence with Holly Green Tributary, downstream of Reis Road

Dominant Fluvial Process
New Ballwin Tributary originates from a detention pond west of New Ballwin Road and flows from a pipe, heading to the southeast, passing under three road crossings (Rustic Valley Drive, Mark Wesley Lane, and Reis Road) before joining the Holly Green Tributary east of Reis Road. Upstream of the Rustic Valley Drive bridge, the channel is actively incising, generating a large volume of coarse bed material. Downstream of Mark Wesley Lane, the stream is gradually recovering from past channel incision and is now depositional in nature. Deposition-induced channel widening poses a threat to channel stability and adjacent infrastructure upstream of Mark Wesley Lane and meander migration poses a similar threat near Reis Road.

Soil Type(s): Haymond silt loam and Urban land-Goss soil complex with 9 to 20 percent slopes.

Haymond silt loam is a well-drained soil occurring in small stream bottoms and adjacent to larger streams. This soil has a moderate permeability and surface runoff is very slow. Areas in which Haymond silt loam occurs are subject to frequent flooding. The Urban land-Goss complex with 9 to 20 percent slopes consists of Urban land and intermingled areas of strongly sloping, well-drained Goss soils. The Urban part of the soil complex is covered by streets, parking lots, or buildings, and is, therefore, impervious to water. Permeability is moderate in Goss soils, and surface runoff is rapid to very rapid in this soil complex.

Geomorphology
Downstream of the outlet at New Ballwin Road the New Ballwin Tributary is wide and sinuous. The left descending bank is tall and eroding, threatening the fencelines of property along Turfwood Drive, upstream of Walnut Point Court.

Moving downstream, the stream bends sharply around the properties on Great Hill Drive. A knick zone occurs through a fractured limestone bed, before reaching the actively incising channel. The incision has carved its way through a less resistant chert channel bed.

Channel incision continues between Echo Hill Court and Great Hill Drive, approaching the Rustic Valley Drive crossing. High cut banks continue to erode on both sides of the channel liberating chert and sediment. The presence of mature “surfing trees” suggests that this reach has been experiencing channel

incision for some time. Roughly eight feet of exposed ductile iron sanitary line crosses the incising channel above the flow line. Signs of active incision diminish immediately upstream of the confluence with a secondary tributary, where a large debris jam has maintained channel grade, acting as a *de facto* grade control.

Immediately upstream of the Rustic Valley Drive culvert there is another fully exposed and undermined ten inch ductile iron sanitary line. This marks the location of another knick point propagating upstream. Approximately 15 feet of the sanitary line is exposed across the channel and acts as a flat weir, promoting bank erosion and channel widening immediately downstream.

Downstream of the Rustic Valley Drive culvert the stream passes behind the backyards of homes along Vernal Hill Court, on top of the right descending bank, and undeveloped common ground on top of the left descending bank. The channel is widening, with a switchback meander and high cutbank along the left descending bank, behind the homes on Briarhill Court. A sanitary manhole is exposed and threatened by the advance of erosion. The sanitary line crossing is exposed in the channel bed. Bank erosion continues down to Mark Wesley Lane. An impromptu interview with a resident revealed that roughly two feet of bank has been lost in the past ten years, along with several mature trees on top of the bank behind 451 Mark Wesley Lane. Channel widening along this reach may be metered by sediment flowing through the Mark Wesley Lane double box culvert. The culvert appears to be relatively new and there is a foot of sediment in both boxes. Reno mattresses on the upstream end of the culvert rise six inches above the flow line of the culvert, whereas the Reno mattresses downstream of the culvert form a sill with a one foot drop. The culvert promotes deposition of bed material on the upstream end. However, the artificial drop in bed slope through the culvert allows bed material to move through in a slug on the falling end of the hydrograph.

Downstream of Mark Wesley Lane channel widening in response to deposition continues to be the dominant fluvial process. However, it appears to be occurring at a much slower rate. Concrete slabs dumped in the channel have formed a center bar that may locally aggravate channel widening.

Approximately 500 feet downstream of Mark Wesley Lane, the Ferris Park Tributary empties into the New Ballwin Tributary from the right descending bank. The Ferris Park Tributary is narrow, incised and U-shaped, and full of debris. It appears to be a significant source of bedload and debris. In the vicinity of the confluence there is a grouted riprap low water bridge. The bridge creates a two foot drop in the channel bed and appears to have been repaired on several occasions. The bridge acts as a significant *de facto* great control, supporting the existing channel bed upstream.

Downstream from the confluence, approaching the culvert at Reis Road, there is an 18 inch CMP armored with gabions. The CMP is responsible for localized

channel widening immediately upstream, generating additional woody debris and sediment in the channel.

The new box culvert at Reis Road has had detrimental effects on the sediment transport and overall stability of the stream. The left descending box of the culvert is 1.5 feet to two feet full of sediment and debris, losing nearly one-quarter of its designed capacity and reducing flood capacity. Part of the difficulty with sediment transport through the culvert is the poor approach. The wing wall and the roadway drainage or front edge of the box is being undermined and scoured and both banks immediately upstream of the culvert are actively eroding. The culvert has also reset the meander pattern of the New Ballwin Tributary. Alternating scoured banks were observed upstream and downstream of Reis Road. Meander migration upstream of Reis Road has resulted in falling trees and more liberated sediment, accelerating the rate of in-filling at the culvert.

Downstream of Reis Road meander migration has been compounded by inappropriately sized riprap that has been dumped in an attempt to armor the bank. This makeshift intervention has only shifted scouring flows downstream. Bank slumping and scour erosion has also been accelerated due to a loss of riparian vegetation as residents have mowed to the top of the stream bank.

The New Ballwin Tributary joins Hollygreen Tributary upstream of Big Bend Road.

Reach Description

Fishpot Tributary Study
Ferris Park Tributary

Length: 3,000 feet
Location: From New Ballwin Road, west to the confluence with New Ballwin Tributary

Dominant Fluvial Process

Ferris Park Tributary is experiencing channel incision from Mark Wesley Lane to the upper reaches of the stream. Although slowed by resistant bedrock, channel incision continues to degrade the channel bed and generate coarse bed material through bedrock plucking.

Soil Type(s): Haymond silt loam and Urban land-Goss complex with 9 to 20 percent slopes.

Haymond silt loam is a well-drained soil occurring in small stream bottoms and adjacent to larger streams. This soil has a moderate permeability and surface runoff is very slow. Areas in which Haymond silt loam occurs are subject to frequent flooding. The Urban land-Goss complex with 9 to 20 percent slopes consists of Urban land and intermingled areas of strongly sloping, well-drained Goss soils. The Urban part of the soil complex is covered by streets, parking lots, or buildings, and is, therefore, impervious to water. Permeability is moderate in Goss soils, and surface runoff is rapid to very rapid in this soil complex.

Geomorphology

The Ferris Park Tributary daylights from a pipe outlet at New Ballwin Road and flows east to its confluence with New Ballwin Tributary, west of Reis Road. Like New Ballwin Tributary, Ferris Park Tributary shows signs of active channel incision in the upper reaches of the stream. Both tributaries also have stretches of channel bed that are bedrock-controlled. These bedrock outcrops have slowed, but not stopped channel incision.

Haphazard dumping of limestone riprap was done in attempts to spot-fix and armor failing banks. Because these banks continue to fail in response to ongoing channel incision, these attempts to curtail bank erosion proved unsuccessful. The periodic stream flow has washed away much of the dumped riprap and transported it downstream.

Reach Description

Fishpot Tributary Study
Bromfield Tributary (**SSMIP Branch C**)

Length: 5,000 feet
Location: From Bromfield Terrace Road, southwest to confluence with Fishpot Creek main stem

Dominant Fluvial Process

The Bromfield Tributary has been highly manipulated, with stream banks heavily armored with gabions, formed concrete walls, or modular block walls. Much of the hard armoring has been in response to bank failures induced by channel incision. These interventions may slow erosion locally, but can not prevent bank failure as the flows of the tributary will continue to undermine these structures.

Soil Type(s): Fishpot-Urban land complex with 0 to 5 percent slopes, Urban land-Harvester complex with 9 to 20 percent slopes, and Urban land-Harvester complex with 2 to 9 percent slopes.

The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex. The Urban land-Harvester soil complex is a mix of paved Urban land and moderately well-drained Harvester soils. Like the Fishpot-Urban land complex, the Urban land is covered by streets, parking lots, or buildings, which are impervious to water. Harvester soils, in yards, between buildings, parks, and undeveloped areas, have moderate permeability. This soil complex results in moderate to low permeability with rapid stormwater runoff.

Geomorphology

The Bromfield Tributary daylights from a pipe east of Hanna Road, and flows west under Hanna Road bridge. This tributary has been highly manipulated and the stream banks are heavily armored with gabions, formed concrete walls, or modular block walls. Channel incision has undermined some of the bank armoring in the upper reaches of the tributary.

Downstream of Hanna Road the channel is vertically stable. However, channel widening and meander migration occur in a 500 foot stretch of channel behind Wayfarer Drive, eroding the stream banks.

Reach Description

Fishpot Tributary Study
Boleyn Tributary

Length: 2,000 feet
Location: From Boleyn Place, southwest to the confluence with Fishpot Creek main stem

Dominant Fluvial Process

Boleyn Tributary is experiencing channel incision in the vicinity of Winding Path Lane. Channel widening observed near the Parkway South athletic fields is the result of direct channel manipulation.

Soil type(s): Fishpot-Urban land complex with 0 to 5 percent slopes, Urban land-Harvester complex with 2 to 9 percent slopes, and Urban land-Harvester complex with 9 to 20 percent slopes.

The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex. The Urban land-Harvester soil complex is a mix of paved Urban land and moderately well-drained Harvester soils. Like the Fishpot-Urban land complex, the Urban land is covered by streets, parking lots, or buildings, which are impervious to water. Harvester soils, in yards, between buildings, parks, and undeveloped areas, have moderate permeability. This soil complex results in moderate to low permeability with rapid stormwater runoff.

Geomorphology

Boleyn Tributary daylights from twin concrete pipes at Boleyn Place and maintains a fairly flat channel bed slope from Boleyn Place down to Winding Path Lane. An undersized culvert at Winding Path is a channel constriction and *de facto* grade control, maintaining the existing channel grade upstream. Downstream of the Winding Path culvert, the channel is incising and there is a six foot knick point in the bedrock channel bed.

Channel widening, coupled with the wholesale removal of riparian vegetation and canopy cover, near the athletic fields at Parkway Southwest Middle School has resulted in a channel that is very shallow (less than three feet deep).

Approaching its confluence with Fishpot Creek, the Boleyn Tributary appears to have stabilized vertically and laterally.

Reach Description

Fishpot Tributary Study
Larkhill Tributary

Length: 2,500 feet
Location: From Larkhill Lane, south to the confluence with Fishpot Creek main stem near Lindy Court

Dominant Fluvial Process

Because nearly the entire 2,500 feet of the Larkhill Tributary has been piped, no fluvial process or geomorphic features were identified.

Soil type(s): Urban land-Harvester complex with 2 to 9 percent slopes, and Urban land-Harvester complex with 9 to 20 percent slopes.

The Urban land-Harvester soil complex is a mix of paved Urban land and moderately well-drained Harvester soils. Like the Fishpot-Urban land complex, the Urban land is covered by streets, parking lots, or buildings, which are impervious to water. Harvester soils, in yards, between buildings, parks, and undeveloped areas, have moderate permeability. This soil complex results in moderate to low permeability with rapid stormwater runoff.

Reach Description

Fishpot Tributary Study
Red Start Tributary

Length: 4,000 feet
Location: From Palm Bay Drive, northeast to the confluence with Fishpot Creek main stem, downstream of Manchester Road

Dominant Fluvial Process
Red Start Tributary is actively incising. However, bedrock outcrops along the banks and in the channel bed have significantly slowed the propagation of channel incision throughout most of the tributary.

Soil type(s): Fishpot-Urban land complex with 0 to 5 percent slopes, Urban land-Harvester complex with 9 to 20 percent slopes, and Winfield silt loam with 9 to 14 percent slopes.

The Fishpot-Urban land complex consists of nearly level and gently sloping, poorly drained Fishpot soils and Urban land. This soil complex is found on flood plains and stream terraces. The Urban land of this complex is covered by streets, parking lots, or buildings, and is impervious to water. The Fishpot soil has moderately slow permeability. Surface runoff is medium in this soil complex. The Urban land-Harvester soil complex with 9 to 20 percent slopes is a mix of paved Urban land and strongly sloping, moderately well-drained Harvester soils. Like the Fishpot-Urban land complex, the Urban land is covered by streets, parking lots, or buildings, which are impervious to water. Harvester soils, in yards, between buildings, parks, and undeveloped areas, have moderate permeability. This soil complex results in moderate to low permeability with rapid stormwater runoff. Winfield silt loam with 9 to 14 percent slopes is a strongly sloping, moderately well-drained soil. Permeability is moderate and surface runoff is rapid.

Geomorphology
Red Start Tributary flows to the northeast, through a 60 inch concrete pipe under New Ballwin Road. Active channel incision continues to liberate rock and gravel from the banks and channel bed. The channel bed is fairly resistant to incision due to bedrock outcrops while, farther downstream, the banks have been armored with gabions, formed concrete walls, or rubble and riprap. However, bank armoring and bedrock control have not halted the upstream progress of incision. This tributary empties into Fishpot Creek about 800 feet downstream of Manchester Road.

Reach Description

Fishpot Tributary Study
Towerwood Tributary

Length: 2,000 feet
Location: From Towerwood Drive, flowing southeast under Great Hill Drive, to the confluence with New Ballwin Tributary

Dominant Fluvial Process

Towerwood Tributary flows from a pipe immediately east of Towerwood Drive, heading to the southeast, passing under Great Hill Drive before joining the New Ballwin Tributary upstream of Rustic Valley Drive. Towerwood Tributary is, for most of its length, actively incising. However, incision diminishes approaching the upper reaches of the tributary.

Soil Type(s): Haymond silt loam and Urban land-Goss soil complex with 9 to 20 percent slopes.

Haymond silt loam is a well-drained soil occurring in small stream bottoms and adjacent to larger streams. This soil has a moderate permeability and surface runoff is very slow. Areas in which Haymond silt loam occurs are subject to frequent flooding. The Urban land-Goss complex with 9 to 20 percent slopes consists of Urban land and intermingled areas of strongly sloping, well-drained Goss soils. The Urban part of the soil complex is covered by streets, parking lots, or buildings, and is, therefore, impervious to water. Permeability is moderate in Goss soils, and surface runoff is rapid to very rapid in this soil complex.

Geomorphology

Incision along the Towerwood Tributary has resulted in tall failing banks behind property on Twigwood Drive and Harvest Hill Court. The most pronounced knick point is located immediately upstream of Great Hill Drive. Incision diminishes upstream of the Turfwood Drive cul de sac. However, failure to control the advancing knick point near Great Hill Drive would compromise the existing stability of the upper reaches of the stream.