MANISTEE COUNTY DRAIN COMMISSION

McGUINEAS AND CROMMER DRAIN

FEASIBILITY ANALYSIS
for
REPAIR OR REPLACEMENT
of
DETERIORATED 30-INCH STORM PIPE

Prepared by: DC Engineering, P.C.
September 18, 2012
(Original - August 2012)

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September 18, 2012 (Original - August 10, 2012)

Feasibility Analysis for Repair or Replacement of Deteriorated 30-inch Storm Pipe
McGuineas Drain
Manistee Township, T22N, R16W, Manistee County

Statement of Problem

The McGuineas and Crommer Drains are located in Manistee Township, Manistee County, Michigan. The outlet of the Crommer Drain is the upstream limit of the McGuineas Drain. The downstream ½ mile of the McGuineas Drain is a 30-inch storm pipe. This feasibility analysis is focused on the deteriorated storm pipe located near the outlet of the McGuineas Drain.

DC Engineering was retained in the summer of 2011 to assist with an evaluation of drainage system, which was in response to flooding that occurred on May 11, 2011. One significant finding from the evaluation is approximately 800 feet of severely deteriorated storm sewer pipe. Most significant failures are located in the upstream end of the 2,500 foot of pipe. The complete findings are published in the letter report dated October, 28, 2011. The report identified the pipe as 36-inch diameter. The correct pipe size is 30-inch diameter.

With consideration of the potential for a catastrophic failure of the storm pipe, which could result in flooding and associated property damage and repair costs, this feasibility analysis was requested. The goal of the feasibility analysis is to determine a cost effective and acceptable solution for repair or replacement of the storm pipe.

Scope of Feasibility Study

This study is to determine feasible alternatives for the rehabilitation and/or replacement of the concrete portion of the 30-inch storm sewer. This analysis does not include providing additional storm sewer capacity to the system to provide for increase in flood protection. The investigation includes: the survey base mapping, development of feasible alternatives, preparation of opinions of probable construction cost for each alternative, and preparation of this feasibility study report.

Survey base mapping along the existing drain right-of-way and the adjacent sections of Kemmer, Brown, and Tubbs Roads was developed for evaluation of the alternatives. Level of mapping detail is in line with the scope of the study. Survey of new ditch alignment ½ mile east of Kemmer was completed by visual inspection.

Four alternative alignments will be evaluated. Each alignment is evaluated for an open ditch construction, enclosed pipe construction, and rehabilitation of the existing pipe as applicable. Figure 1 depicts the alignment of each alternative route. Alignment and construction type analyzed are presented in Table1.

Table 1
Alignment and Construction Alternatives

Alignment	Construction Type
1. Existing alignment	A. Install pipe liner B. Open ditch to north boundary of County Farm Subdivision, then install pipe liner to south project limits C. Open ditch to north boundary of County Farm Subdivision, then new storm pipe to south project limits. D. New pipe along entire route
2. East side of Kemmer Road to Brown Road, thence along south side of Brown Road to the existing storm sewer, thence to the south project limits.	A. Open ditch along Kemmer, then new storm pipe along Brown and new storm pipe to south project limits. B. Open ditch along Kemmer, then new storm pipe along Brown, then install pipe liner to south project limits. C. New pipe along entire route.
3. East side of Kemmer Road to Tubbs Road, thence along south side of Tubbs Road to the existing storm sewer, thence to the south project limits.	A. Open ditch along Kemmer, then new pipe under Kemmer, then open ditch along Tubbs, then new storm pipe to south project limits. B. New storm pipe along entire route
4. New drain outlet located 1/2 mile east of Kemmer Road.	A. Open ditch from the McGuineas Drain to north of US31, enclosed pipe north side of US31 to Manistee River, open ditch and associated outfall to discharge to Manistee River. Rehabilitate existing 30-inch storm sewer to provide service to Kemmer Road area.

Existing Conditions and Observations

The existing 30-inch storm pipe from the inlet on the east side of Kemmer Road to the outlet on the south side of US31 was televised by Pollution Control Services (PCS) on August 25, 2011. The inspection accessed the pipe at three locations: Downstream Outlet, Catch Basin at Tubbs Road, and access hole constructed by the County Drain Office on the west side of Kemmer Road. Figure 2 provides an overview of the televised inspection results. The PCS operator logs are provided in Appendix A.

The televised inspection was able to inspect all but 250 feet of the 30-inch storm sewer. There are three locations where the inspection was not able to be completed. First, the 40 feet of storm pipe under Kemmer Road from the inlet to the bend in the storm pipe was not televised to the trash grate

on the inlet and the bend in the pipe. Second, between Brown Road and Tubbs Road, 70 feet of the storm pipe could not be televised due to significant deposits of sand which prohibited the advancement of the camera. Third, between Tubbs Road and the Outlet, there is approximately 150 feet of the pipe which was not inspected. The inspection from the Outlet end was stopped at a midline catch basin. The inspection from Tubbs Road was stopped 1290 feet south of Tubbs Road, due to limitation of the camera equipment. The camera was physically unable to pull more length of cable through the pipe.

Topographic survey was performed by DC Engineering on June 28, 2012. The survey was limited to the existing drainage easement and roadway corridors. The vertical datum utilized an established National Geodetic Survey (NGS) marker at the intersection of US31 and Kemmer Road. The datum is North American Vertical Datum (NAVD) 88. Figure 3 provides the site survey.

Internal Televised Inspection

The existing 30" drain pipe from the inlet on the east side of Kemmer Road to the outlet on the south side of US31 was televised by Pollution Control Services on August 25, 2011. The NASSCO Condition Rating ranged from 2.0 (Minimal collapse risk) to 5.0 "Collapse imminent".

The inspection indicated the following:

- From the outlet south of US31 to 140 feet south of Tubbs Road, the pipe is made of vitrified clay pipe (VCP). From 140 feet south of Tubbs Road to the inlet at Kemmer Road, the pipe is made of concrete. The 2672 foot long 30-inch storm sewer consists of 1465 feet of VCP and 1207 foot of concrete pipe. All of the significant structural defects are located within the concrete pipe section.
- Between the inlet at Kemmer to just south of Brown, the majority of concrete pipe invert is significantly deteriorated or missing. This structural defect has a NASSCO Condition Rating of 5.0 "Collapse Imminent".
- Between the inlet at Kemmer Road and Brown Road, there are 5 holes and 2 fractured pipe sections. These structural defects have NASSCO Condition Rating of 5.0 "Collapse imminent".
- A buried structure is located approximately 350 feet south of the inlet at Kemmer.
- Between Brown and just south of Tubbs there are 2 locations of fractures and 2 holes in the pipe. These structural defects have NASSCO Condition Rating of 5.0 "Collapse imminent".
- Between Brown and Tubbs, there is significant sand/debris deposits in the invert of the pipe. These deposits prohibited the inspection of the pipe invert in this reach. Due to the deteriorated conditions observed both upstream and downstream, the condition of the pipe invert beneath the sand/debris deposits is suspect.
- An existing catch basin/inlet exists on the north side of Tubbs.
- Between Tubbs to 140 feet south of Tubbs, the pipe invert shows signs of scour, such that aggregate is visible. There are 4 locations at joints where the scour is deeper. These

structural defects have NASSCO Condition Rating of 2.0 "Minimal collapse risk" for the scoured sections to 4.0"Collapse likely in foreseeable future" for the deeper scour holes at the joints.

- There are 3 locations of lineal cracking at the pipe invert within the VCP section. None of these cracks appears to be a structural concern. These structural defects have NASSCO Condition Rating of 3.0 "Collapse unlikely in near future".
- There is significant amount of "fine" root intrusions within the length of VCP pipe between Tubbs Road and US31. Root intrusions are not creating a blockage of flow, and therefore, are not a concern at this time.
- There are six lateral connections. One located in the concrete pipe section and 5 located within the VCP section.
- A buried structure is located approximately 250 feet north of US31.
- A buried structure is located approximately 400 feet south of US31.

Other Observations

- There are three locations of known sink holes over the existing 30-inch sewer.
- The house structure at 1480 Brown Road House is approximately 10.5 feet within the County Drain easement. The northwest corner of the house is approximately 4 ½ feet from the existing storm sewer
- A shed at the north side of 1480 Brown Road is approximately 1 foot within the County Drain easement.
- A well house was surveyed at 1950 Kemmer Road. The center of the well house is approximately 3.5 feet within the County Drain easement or 13 feet from the centerline of the existing storm sewer.
- Change from concrete pipe to vitrified clay pipe occurs near the south end of the plat of the County Farm Subdivision.
- It appears the properties within the County Farm Subdivision are serviced by buried rear lot–line electrical and telecommunication. A communication riser located on the property at 1950 Kemmer Road is within the County Drain Easement. The center of the riser is approximately 1.5 feet within the easement.
- An existing 15-inch culvert crosses US31 approximately 400 feet west of the proposed Alignment #4.
- General observation regarding trees is as follows:
    - 2028 Kemmer Road: There are two stands of wooded area along the route of the existing drainage easement.
    - 1480 Brown Road: There are two large trees within the existing drainage easement.
    - Vacant lot NW Kemmer/Tubbs: There one tree within the existing drainage easement.
    - 1876 Kemmer Road: The drainage easement is heavily wooded.

- East side of Kemmer Road: Heavily wooded for northern 200 feet. No trees within remaining area.
- South side of Brown Road: No trees within the right-of-way.
- North side of Tubbs Road: Heavy brush/woods entire length of right-of-way.

Feasible Alternatives

The following provides discussion of the feasible alternatives for each alignment. Figures are provided showing location of the proposed work and significant impacts. An opinion of probable project cost (OPPC) has been developed for each alternative. An overview of the alternative alignments is included in Figure 1. OPPC work sheets are included in appendix B.

Limits of Work

The pipe inspections have identified multiple structural pipe defects within the concrete pipe section. The majority of these defects have NASSCO Structural Defect rating of 4.0 "Collapse likely in foreseeable future" to 5.0 "Collapse imminent". The VCP pipe has a NASSCO rating of 2.0 "minimal collapse risk" with 3 location of rating of 3.0 "Collapse unlikely in the near future". Therefore, for the purpose of this report, the limits of the proposed work include the rehabilitation and/or replacement concrete pipe section from approximately 140 feet south of Tubbs Road to its inlet at Kemmer Road.

The televised inspection revealed sand/sludge deposits prohibiting the inspection of the pipe invert between Brown and Tubbs Road. This section of sewer should be cleaned and re-inspected to assess the actual condition of the pipe invert. If the pipe invert is found to be in good condition, the limits of the work may be revised and the scope of the corrective actions changed to include spot repairs of the existing sewer.

Discussion of Construction Type

The following provides discussion on the various construction types to be considered in the selection of the corrective action alternative.

Line pipe with Cured-in-Place Pipe (CIPP) liner

CIPP liner is an epoxy impregnated felt liner which is installed into the existing sewer and inflated to conform to the existing sewer shape. The liner is heat cured to form a solid pipe wall. The liner is designed to withstand the loadings on the pipe without considering any structure strength of the existing sewer. Therefore, it functions as a stand-alone sewer pipe.

Because the liner will be placed inside the existing pipe, the rehabilitated pipe diameter will be smaller than the original pipe size. Generally, this decrease in diameter does not impact the pipe capacity as the smoothness of the liner compensates for the reduction in the diameter.

The installation of a cure-in-place liner is the least intrusive corrective action to local residents. This work can likely be accomplished from within the existing road right-of-ways. Duration of construction is a little as 1/10th the time to construct new ditches/storm sewers.

Long term maintenance of this system consists of maintaining the pipe in a clean condition. This is the same as a pipe system. This system has a life-span of 50-100 years.

New Pipe

New storm sewer pipe could be installed to replace the failing pipe. Because pipes are buried they have no detrimental effects on the local area aesthetics.

Storm sewer through existing residential may have impact on local septic fields. Fields are required by State Code to be at least 50 feet from storm sewers.

Long term maintenance of this system consists of maintaining the pipe in a clean condition. This system has a life-span of 50-100 years.

New Ditch

The open ditch alternatives will result in ditch sections up to 13 feet deep. The construction of this system is highly intrusive to the community/area. Although the slopes of the ditch bank are mowable, they are often not mowed on a regular basis (or not at all) allowing for the ditches to become overgrown with brush. The ditch may be viewed as un-aesthetically pleasing, particularly in a residential setting.

The acquisition of easements is required for all new open ditch alternatives. The cost of the easement purchase has not been included in the OPPC. These costs are dependent upon the successful negotiation with the property owner. If the easement can not be negotiated, the new ditch alternative is not feasible.

Ditches are proposed to be constructed with a 2 foot bottom and side slope of 1Vertical:4Horizontal. The proposed ditch will convey the estimated 100 year storm flows. However, the system is limited to the capacity of the 30-inch VCP outlet pipe. The ditch section does provide for some flood storage in comparison to an enclosed pipe system.

Open ditch section through existing residential may have impact on local septic fields. Septic fields are required by State Code to be at least 100 feet from open water courses. This is a 50 foot increase in setback distance when you change from a pipe to open ditch system.

Long term maintenance consists of maintaining the ditch geometry. Maintenance activities include removal of brush/logs/debris, removal of trees from flow path, removal accumulated sediments, and repair of eroded sections. Life span of an open ditch is indefinite as long as it is properly maintained.

Alignment 1: Existing Alignment

This alignment will follow the existing storm sewer. There are four alternatives along this alignment as follows:

Alternate 1A: Rehabilitate Pipe, Existing Alignment, Figure 4

Construct a cured-in-place-pipe (CIPP) structural liner from the south end of the concrete pipe to the inlet at Kemmer Road. Two manholes will need to be constructed to provide access to install the liner. One manhole will be located at the south end of the project limits. One manhole will be located at Brown Road.

There are no conflicts with existing infrastructure for this alternative.

The OPPC for this option is $373,402

Alternate 1B: New Ditch/New Pipe, Existing Alignment, Figure 5

The existing 30-inch sewer pipe will be removed and a new ditch will be constructed from the north line of the County Farm Subdivision to Kemmer Road. New 30-inch storm culverts will be constructed at Kemmer Road and the driveway for 2028 Kemmer Road. A new 30-inch storm sewer will be constructed from the south project limits to the north line of the subdivision. A new manhole and catch basin will be constructed at Tubbs Road. New headwalls will be constructed at all proposed pipe inlets.

The new ditch section will be up to 12 feet deep. This correlates to a top width of the ditch of 100 feet. The existing drainage easement is 33 foot wide, so additional drainage easement will be required.

The proposed storm sewer will have several conflicts with existing infrastructure including:

1. The new storm sewer will be up to 12 feet deep. The trench excavation, pending actual soil conditions, may result in a trench width up to 30 feet. Although this is within the existing 33 feet drainage easement, there will not be adequate area to operate equipment. Therefore, temporary construction easements will be necessary.
2. House at 1480 Brown Road is within sewer easement. The NW corner of house within 4 ½ feet of the existing storm sewer. Special construction methods will be required to construct the new storm sewer while protecting/supporting the existing house.
3. A well (within a well house) is located within 11.5 feet of the existing storm sewer. Per State Code, the proposed storm sewer will need to remain at least 10 feet from the actual well location. The storm sewer trench will expose the existing well, and therefore, the well will need to be protected.
4. There is potential to impact the other 4 well systems for adjacent properties and septic fields for all adjacent properties along the route.

The OPPC for this option, not including relocation of wells/septic fields and easement purchase is $361,338.

Alternate 1C: New Ditch/CIPP liner, Existing Alignment, Figure 6

This alignment is same as Alternate 1B except that the existing pipe south of the northern boundary of the County Farm Subdivision will have a CIPP liner installed in lieu of replacement. This option will eliminate conflicts #1-3 with existing infrastructure discussed under Alternative 1B. The conflict with potential well/septic field conflicts will exist for one parcel (2028 Kemmer).

The OPPC for this option, excluding easement purchase, is $408,194.

Alternate 1D: New Pipe, Existing Alignment, Figure 7

The existing 30-inch sewer pipe will be removed and a new 30-inch storm sewer will be constructed. A new manhole will be construction at the south project limits, at Brown Road and a new manhole and catch basin will be constructed at Tubbs Road. A new headwall will be constructed at the inlet at Kemmer Road.

The storm sewer construction will have the same four conflicts with existing infrastructure as discussed in Alternative 1B.

The OPPC for this option, not including relocation of wells and septic fields is $324,333.

Alignment 2: Kemmer/Brown Road

This alignment begins at the beginning of the concrete section south of Tubbs Road northward along the existing pipe alignment to Brown Road. Then along the south side of Brown Road to the east side of Kemmer Road. Then northward along the east side of Kemmer Road to the existing open ditch.

There are two alternatives along this alignment as follows:

Alternate 2A: New Ditch/New Pipe, Kemmer/Brown, Figure 8

A new 30-inch storm sewer will be constructed from the south end of the project limits to Brown Road and along the south side of Brown Road to the east side of Kemmer Road. A new ditch will be constructed on the east side of Kemmer Road northward to the existing open ditch. A new catch basin will be installed on the east side of Kemmer Road at the existing 30-inch storm sewer crossing. A 12-inch storm sewer will be installed inside the existing 30-inch storm sewer to the east side of Kemmer Road. The existing 6-inch storm sewer connected to the existing 30-inch sewer 350 feet south of the inlet to Kemmer Road will be extended to the proposed catch basin. A new manhole will be construction at south project limits, at Brown Road, and at the east side of Kemmer Road. A new manhole and catch basin will be constructed at Tubbs Road. A new headwall will be constructed at the inlet at Kemmer Road. The existing drainage easement will be vacated between Brown Road and Kemmer Road.

The proposed storm sewer will have several conflicts with existing infrastructure including:

1. The new ditch will be up to 12 feet deep. This correlates to a top width of 100 feet. This will directly impact existing utility poles on east side of Kemmer Road. Therefore, the

ditch is proposed to be located east of the utility poles. The new ditch section will be outside the existing road right-of-way. Therefore, additional easement from the parcel on east side of Kemmer Road will be required.

2. The new storm sewer will be up to 12 feet deep. The trench excavation, pending actual soil conditions, may result in a trench width up to 30 feet. Although this is within the existing 33 feet drainage easement, there will not be adequate area to operate equipment. Therefore, temporary construction easement will be required
3. A well (within a well house) is located within 11.5 feet of the existing storm sewer. Per State Code, the proposed storm sewer will need to remain at least 10 feet from the actual well location. The storm sewer trench will expose the existing well, and therefore, the well will need to be protected.
4. There is potential to impact the other 2 well systems for adjacent properties and septic fields for all adjacent properties along the new pipe route.

The OPPC for this option, excluding easement purchase and relocation of well/septic fields, is $441,861.

Alternate 2B: New Ditch/CIPP liner, Kemmer/Brown, Figure 9

This alignment is same as Alternate 2A except that the existing pipe south Brown Road will have a CIPP liner installed in lieu of replacement. This option will eliminate the conflicts #2-4 discussed under Alternative 2A.

The OPPC for this option is $446,443.

Alternate 2C: New Pipe, Kemmer/Brown, Figure 10

A new 30-inch storm sewer will be constructed along the entire alignment. A new catch basin will be installed on the east side of Kemmer Road at the existing 30inch storm sewer crossing. A 12-inch storm sewer will be installed inside the existing 30-inch storm sewer to the east side of Kemmer Road. The existing 6-inch storm sewer connected to the existing 30-inch sewer 350 feet south of the inlet to Kemmer Road will be extended to the proposed catch basin. A new manhole will be construction at south project limits, at Brown Road, and at the east side of Kemmer Road. A new manhole and catch basin will be constructed at Tubbs Road. A new headwall will be constructed at the inlet at Kemmer Road. The existing drainage easement will be vacated between Brown Road and Kemmer Road.

The proposed construction will have the same conflicts #2-4 as discussed in Alternate 2A.

To avoid impacts to the utility poles along the east side of Kemmer Road, the proposed sewer will be constructed 5 feet from the east edge of Kemmer Road. Therefore, a portion of Kemmer Road will be removed.

The OPPC for this option, excluding relocation of well/septic fields, is $394,971.

Alignment 3: Kemmer/Tubbs Road

This alignment begins at the beginning of the concrete section south of Tubbs Road northward along the existing pipe alignment to Tubbs Road. Then along the north side of Tubbs Road to the east side of Kemmer Road. Then northward along the east side of Kemmer Road to the existing open ditch.

There are two alternatives along this alignment as follows:

Alternate 3A: New Ditch/New Pipe, Kemmer/Tubbs, Figure 11

A new 30-inch storm sewer will be constructed from the south end of the project limits to Tubbs Road. A new ditch will be construction on the north side of Tubbs Road and along the east side of Kemmer Road to the existing open ditch. A 30-inch storm culvert will be constructed across Kemmer Road and Tubbs Road. A new catch basin will be installed on the east side of Kemmer Road at the existing 30-inch storm sewer crossing. A 12-inch storm sewer will be installed inside the existing 30-inch storm sewer to the east side of Kemmer Road. The existing 6-inch storm sewer connected to the existing 30-inch sewer 350 feet south of the inlet to Kemmer Road will be extended to the proposed catch basin. A new manhole will be construction at south project limits. A new headwall will be constructed at all pipe inlets. The existing drainage easement will be vacated between Tubbs Road and Kemmer Road.

The proposed storm sewer will have several conflicts with existing infrastructure including:

1. The new storm sewer south of Tubbs Road will be up to 6 feet deep. The trench excavation, pending actual soil conditions, may result in a trench width up to 18 feet. Although this is within the existing 33 feet drainage easement, there will not be adequate area to operate equipment. Therefore, temporary construction easement will be required.
2. The new ditch along Tubbs Road will be up to 10 feet deep. This correlates to a top width of 84 feet. The new ditch will be outside the existing 66 foot Tubbs Road right-of-way. Therefore, additional easement will be required.
3. The new ditch along Kemmer Road will be up to 12 feet deep. This correlates to a top width of 100 feet. This will directly impact existing utility poles on east side of Kemmer Road. Therefore, the ditch is proposed to be located east of the utility poles. The new ditch section will be outside the existing road right-of-way. Therefore, additional easement from the parcel on east side of Kemmer Road will be required.
4. There is potential to impact the well systems and septic field for 1876 Kemmer.

The OPPC for this option, excluding easement purchase and relocation of well/septic fields, is $465,791.

Alternate 3B: New Pipe, Kemmer/Tubbs, Figure 12

A new 30-inch storm sewer will be constructed along the entire alignment. A new catch basin will be installed on the east side of Kemmer Road at the existing 30-inch storm sewer crossing. A 12-inch storm sewer will be installed inside the existing 30-inch storm sewer to the east side of

Kemmer Road. The existing 6-inch storm sewer connected to the existing 30-inch sewer 350 feet south of the inlet to Kemmer Road will be extended to the proposed catch basin. A new manhole will be construction at south project limits, at the east side of Kemmer Road, and at Brown Road. A new manhole and catch basin will be constructed at Tubbs Road. A new headwall will be constructed at the inlet at Kemmer Road. The existing drainage easement will be vacated between Tubbs Road and Kemmer Road.

The proposed construction will have the same conflicts #1 & 4 as discussed in Alternate 3A. This alternative will have the following additional conflict.

1. To avoid impacts to the utility poles along the east side of Kemmer Road, the proposed sewer will be constructed 5 feet from the east edge of Kemmer Road. Therefore, a portion of Kemmer Road will be removed.

The OPPC for this option, excluding relocation of well/septic fields, is $454,878.

Alignment 4: ½ Mile East of Kemmer Road

This alignment is located approximately ½ mile east of Kemmer Road. The route begins at the Manistee River and runs northward across US31 to the existing open ditch.

There is one alternative for this alignment as follows:

Alternate 4A: New Drain Outlet, ½ Mile East of Kemmer Road, Figure 13

A new ditch will be constructed from the Manistee River northward to US31. A 72-inch storm sewer will be constructed under US31 using trenchless technologies. The new ditch will continue on the north side of US 31to the exiting McGuineas Drain. A new outfall to the Manistee River will be constructed. Headwalls will be constructed at the culvert ends at US31.

Michigan Department of Environmental Quality (MDEQ) approval for this work is required. Explicitly, a floodplain permit will be required for working within the 100 year floodplain of the Manistee River. It is anticipated that a wetland permit will be required for the work in close proximity to the Manistee River and in the lower lands between the existing McGuineas Drain and US 31. This alternative provides additional outlet capacity for the McGuineas Drain system. This additional increase of peak storm flows to the Manistee River will need to be approved by the MDEQ. Discussions with the MDEQ should be done prior to selection of this alternative to determine feasibility of this alternative. Discussions should include: increase in storm water discharge to the Manistee River, requirements for working within the floodplain and wetlands, soil erosion control requirements at the interface of the new outlet and Manistee River.

The existing 30-inch storm sewer will still require rehabilitation/replacement to provide service to the land tributary to the existing inlet at Kemmer Road, the 6-inch tile drain 350 feet downstream of the inlet, and the catch basin at Tubbs Road. Rehabilitation/replacement would be accomplished by one of the approaches discussed above.

The proposed storm sewer will have several conflicts with existing infrastructure including:

1. Ditch system would be an estimated 15 feet deep, resulting in a top-width of 125 feet. Therefore a 150 foot easement would be required.
2. Utility conflicts within the US31 corridor were not analyzed. This would need to be performed to confirm the construction is feasible.
3. There is potential to impact the well systems and septic field for properties along the proposed route.

This new drain location would require the following additional permits for construction:

- MDEQ Floodplain Permit
- MDEQ Wetland Permit
- MDOT Right-of-Way Permit

The OPPC for this option, excluding easement purchase, wetland mitigation and relocation of wells/septic fields, is $2,145,000.

Conclusion

The existing 30-inch storm sewer between the inlet at Kemmer Road to 140 feet south of Tubbs Road (concrete portion) is in a deteriorated condition. The invert of the northern 800 feet of the pipe is severely deteriorated, and at multiple locations, no longer exists. This section of the sewer is in a condition of "Imminent Failure". Failure of this pipe could result in flooding and damage to personal property during a small storm event. Repair/replacement of this section of sewer is critical. The remaining section from 140 feet south of Tubbs Road to the Outlet (VCP portion) is in good condition with a few minor defects. Repair/replacement of this section of sewer is not necessary at this time.

The feasible alternatives have impacts which will need to be addressed prior to selection of a recommended alternative with the exception of Alternative 1A, CIPP liner. All new pipe alternates have potential conflicts with existing well/septic fields and will require temporary construction easements. All new ditch alternates have potential conflict with well/septic fields and will require the acquisition of permanent drain easements.

There are two intangible benefits for the alternates which route new infrastructure along Kemmer Road. First benefit is the vacating of drain easement through the residential properties. Second benefit is that access to the new drain will primarily be through the road right-of-way.

Table 2 provides a summary of alternatives including list of discussion items and OPPC.

The section of VCP sewer should be re-inspected every 5 years to assess the condition of the observed root intrusion and existing cracks. Root intrusion growth resulting in a reduction of more than 10% of the flow area should be removed. Cracks which further deteriorate into

fractures/broken/holes should be repaired. The two buried structures (150 feet north and 400 feet south of US31) should be excavated and the castings raised to grade to provide access to the storm sewer.

Table 2
McGuineas Drain Improvements
Summary of Alternatives

Alternate: Construction Type Route	**Points of Discussion**	**Opinion of Probable Project Cost (OPPC)**
Alternate 1A: Rehabilitate Pipe Existing Alignment	• No additional easement • Least intrusive to property owners	$373,402
Alternate 1B: New Ditch/New Pipe Existing Alignment	• Additional permanent easement required • Temporary construction easements required • Conflict with house • Conflict with well • Potential conflict with septic/well (5 parcel)	$361,338 Plus easement Plus septic/well
Alternate 1C: New Ditch/CIPP Liner Existing Alignment	• Additional permanent easement required • Potential conflict with septic/well (1 parcel)	$408,194 Plus easement Plus septic/well
Alternate 1D: New Pipe Existing Alignment	• Temporary construction easements required • Conflict with house • Conflict with well • Potential conflict with septic/wells (5 parcel) • Improved access to infrastructure	$324,333 Plus septic/well
Alternate 2A: New Ditch/New Pipe Kemmer/Brown	• Additional easement required • Temporary construction easements required • Vacate drain easement: Kemmer to Brown • Potential conflict with septic/wells (3 parcel) • Improved access to infrastructure	$441,861 Plus easement Plus septic/well
Alternate 2B: New Ditch/CIPP Liner Kemmer/Brown	• Additional easement required • Vacate drain easement: Kemmer to Brown • Improved access to infrastructure	$446,443 Plus easement
Alternate 2C:New Pipe Kemmer/Brown	• Temporary Construction Easements • Vacate Drain Easement: Kemmer to Brown • Potential conflict with septic/wells (3 parcel) • Improved access to infrastructure	$394,971 Plus septic/well
Alternate 3A: New Ditch/New Pipe Kemmer/Tubbs	• Additional easements required • Temporary construction easement required • Vacate drain easement: Kemmer and Tubbs • Potential conflict with septic/well (1 parcel) • Improved access to infrastructure	$465,791 Plus easements Plus septic/well
Alternate 3B: New Pipe Kemmer/Tubbs	• Temporary construction easement required • Vacate drain easement: Kemmer and Tubbs • Potential conflict with septic/well (1 parcel) • Improved access to infrastructure	$454,878 Plus septic/well
Alternate 4A: New Drain Outlet ½ Mile East Kemmer	• Still Need to Rehabilitate/Replace Existing 30" • Provide flood relief • Additional easements required • MDOT (US31 crossing) approval required • MDEQ approval required • Floodplain permit requirements • Wetland permit requirements	$2,145,000 Plus 30" Storm Alternative Plus easements Plus Wetland Mitigation Plus septic/well

Figures

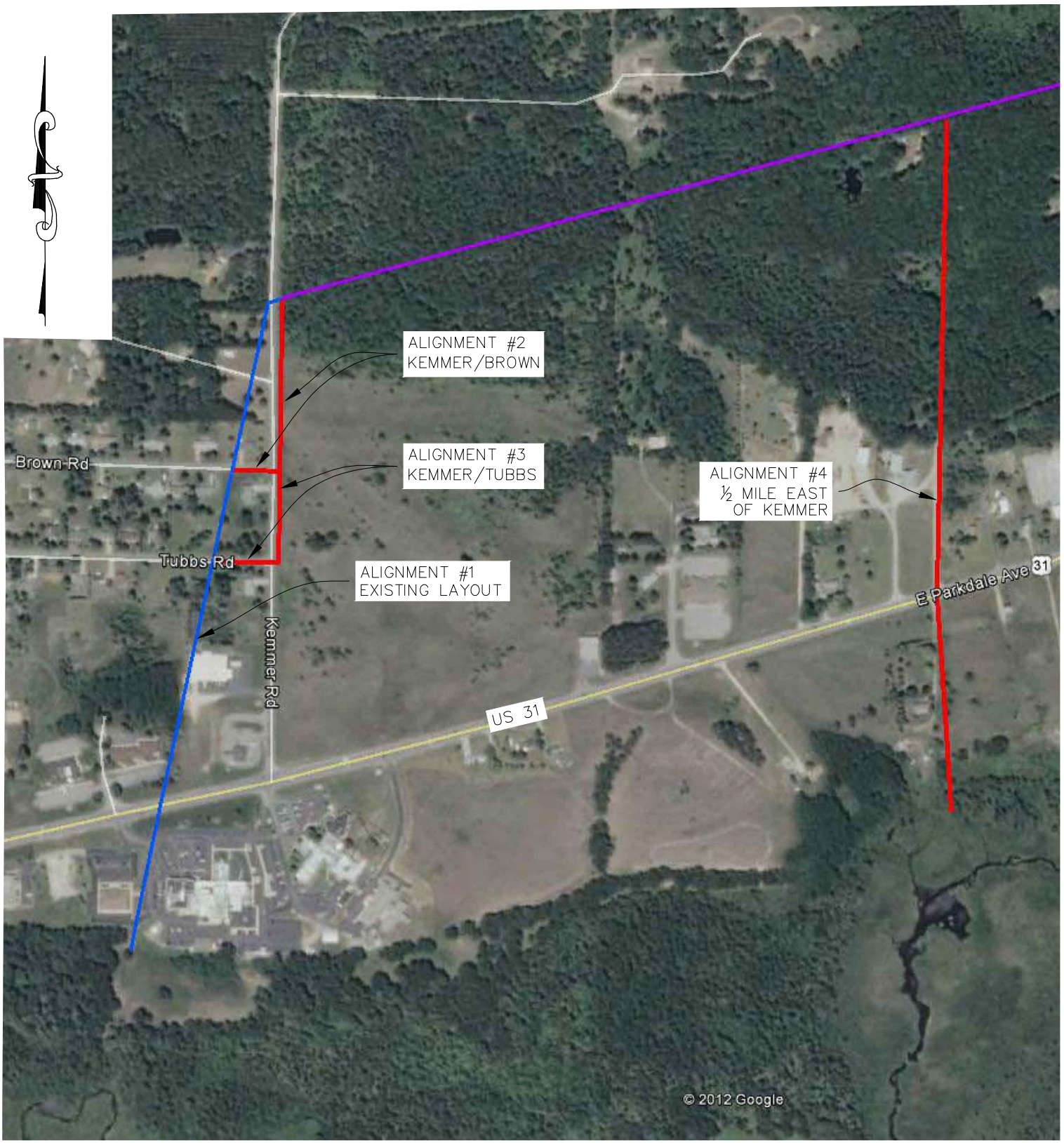

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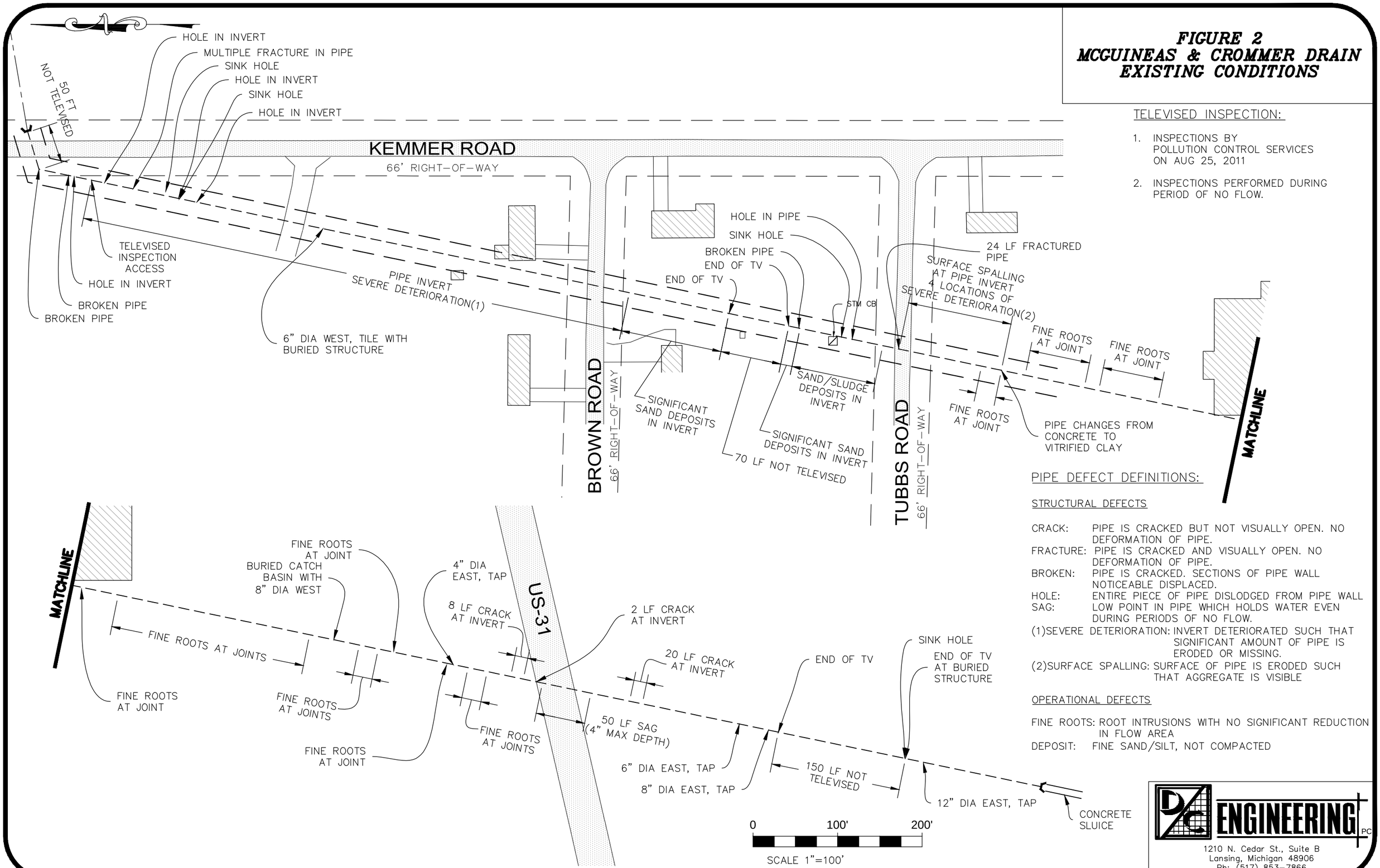
FIGURE 1
MCGUINEAS & CROMMER DRAIN
ALTERNATE ALIGNMENTS

DWG: SPS	CHKD: DSC
CLIENT: MCDC	
PROJECT: MCGUINEAS DRAIN	
SCALE: NOT TO SCALE	
DATE: 7/11/2012	SHEET: 1 of 1

FIGURE 2
MCGUINEAS & CROMMER DRAIN
EXISTING CONDITIONS



TELEVISED INSPECTION:

1. INSPECTIONS BY POLLUTION CONTROL SERVICES ON AUG 25, 2011
2. INSPECTIONS PERFORMED DURING PERIOD OF NO FLOW.

PIPE DEFECT DEFINITIONS:

STRUCTURAL DEFECTS

CRACK: PIPE IS CRACKED BUT NOT VISUALLY OPEN. NO DEFORMATION OF PIPE.
FRACTURE: PIPE IS CRACKED AND VISUALLY OPEN. NO DEFORMATION OF PIPE.
BROKEN: PIPE IS CRACKED. SECTIONS OF PIPE WALL NOTICEABLE DISPLACED.
HOLE: ENTIRE PIECE OF PIPE DISLODGED FROM PIPE WALL
SAG: LOW POINT IN PIPE WHICH HOLDS WATER EVEN DURING PERIODS OF NO FLOW.
(1)SEVERE DETERIORATION: INVERT DETERIORATED SUCH THAT SIGNIFICANT AMOUNT OF PIPE IS ERODED OR MISSING.
(2)SURFACE SPALLING: SURFACE OF PIPE IS ERODED SUCH THAT AGGREGATE IS VISIBLE

OPERATIONAL DEFECTS

FINE ROOTS: ROOT INTRUSIONS WITH NO SIGNIFICANT REDUCTION IN FLOW AREA
DEPOSIT: FINE SAND/SILT, NOT COMPACTED

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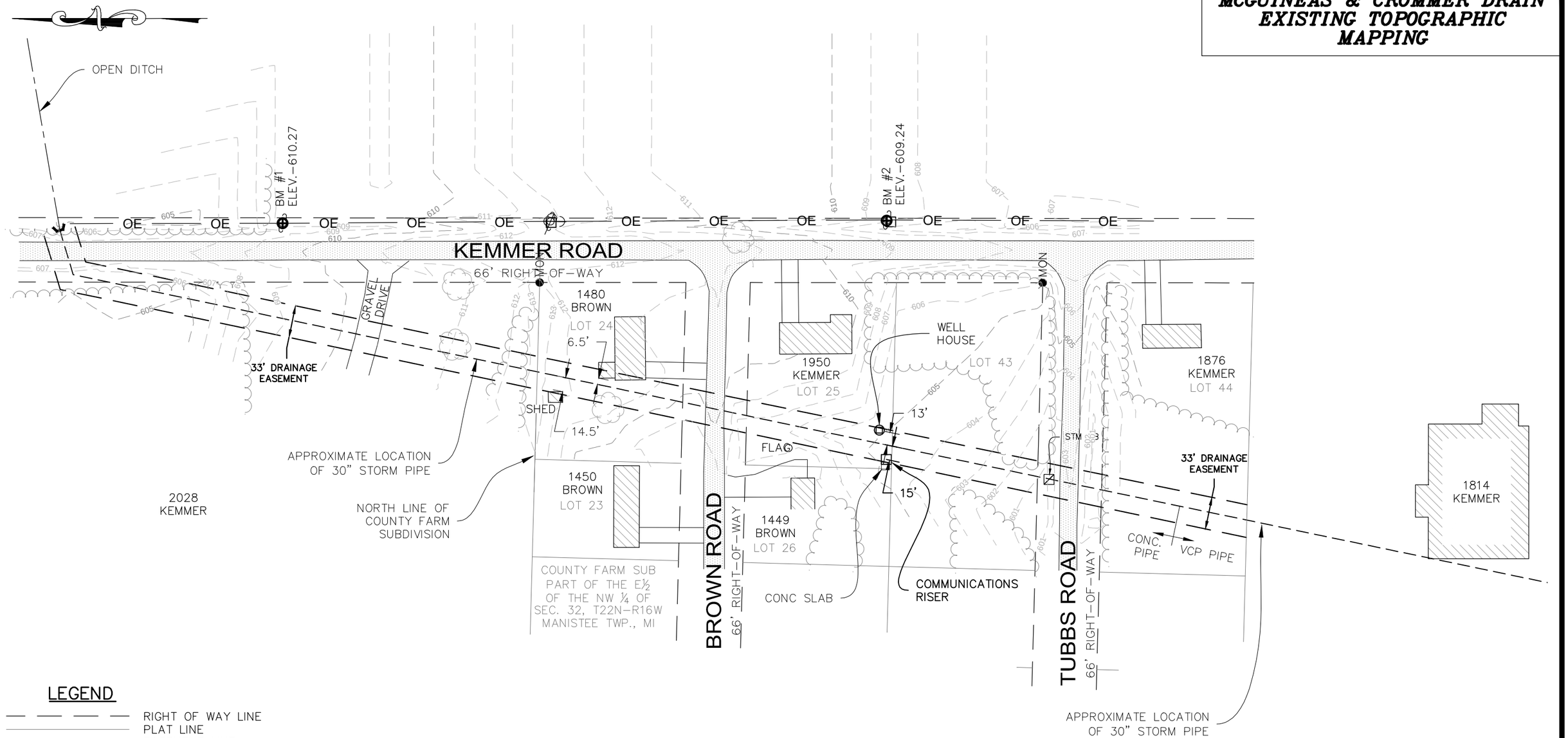
FIGURE 3
MCGUINEAS & CROMMER DRAIN
EXISTING TOPOGRAPHIC MAPPING



LEGEND

- RIGHT OF WAY LINE
- PLAT LINE
- EASEMENT LINE
- EXISTING STORM SEWER
- OE — OVERHEAD ELECTRIC
- MAJOR CONTOUR
- MINOR CONTOUR
- TREE LINE
- BENCHMARK
- UTILITY POLE
- COMM RISER

BENCH MARKS

BM #1
MAG NAIL IN WEST FACE UTILITY POLE
ELEV. = 610.27

BM #2
MAG NAIL IN WEST FACE UTILITY POLE
ELEV. = 609.24

0 80' 160'

SCALE 1"=80'

D/C ENGINEERING PC
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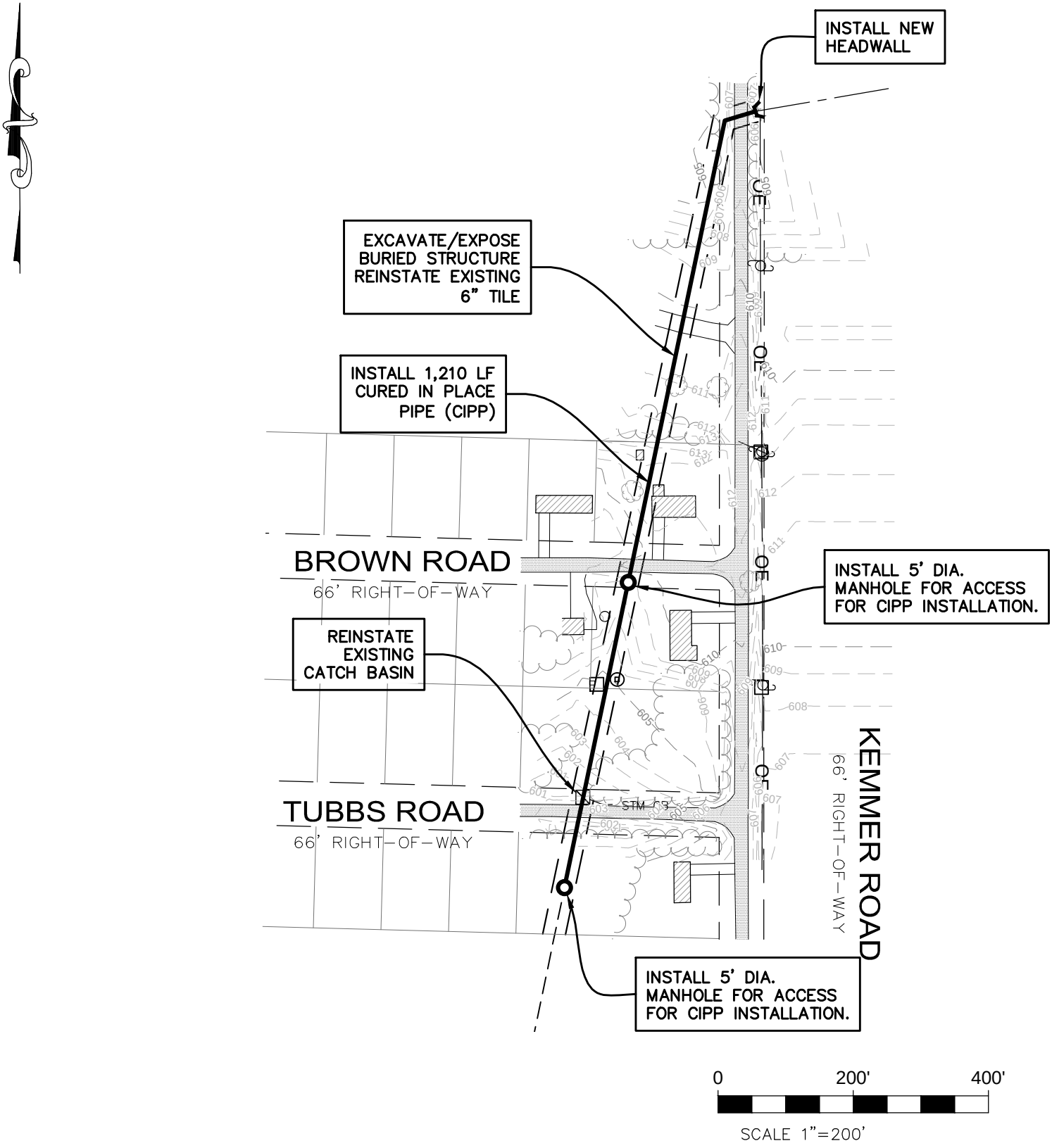

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Ph: (517) 853-7866

FIGURE 4
MCGUINEAS & CROMMER DRAIN
ALTERNATE 1A
REHABILITATE PIPE
EXISTING ALIGNMENT

DWG: SPS	CHKD: KRK
CLIENT: MCDC PROJECT: MCGUINEAS DRAIN	
SCALE: 1"=200'	
DATE: 7/26/2012	SHEET: 1 of 1

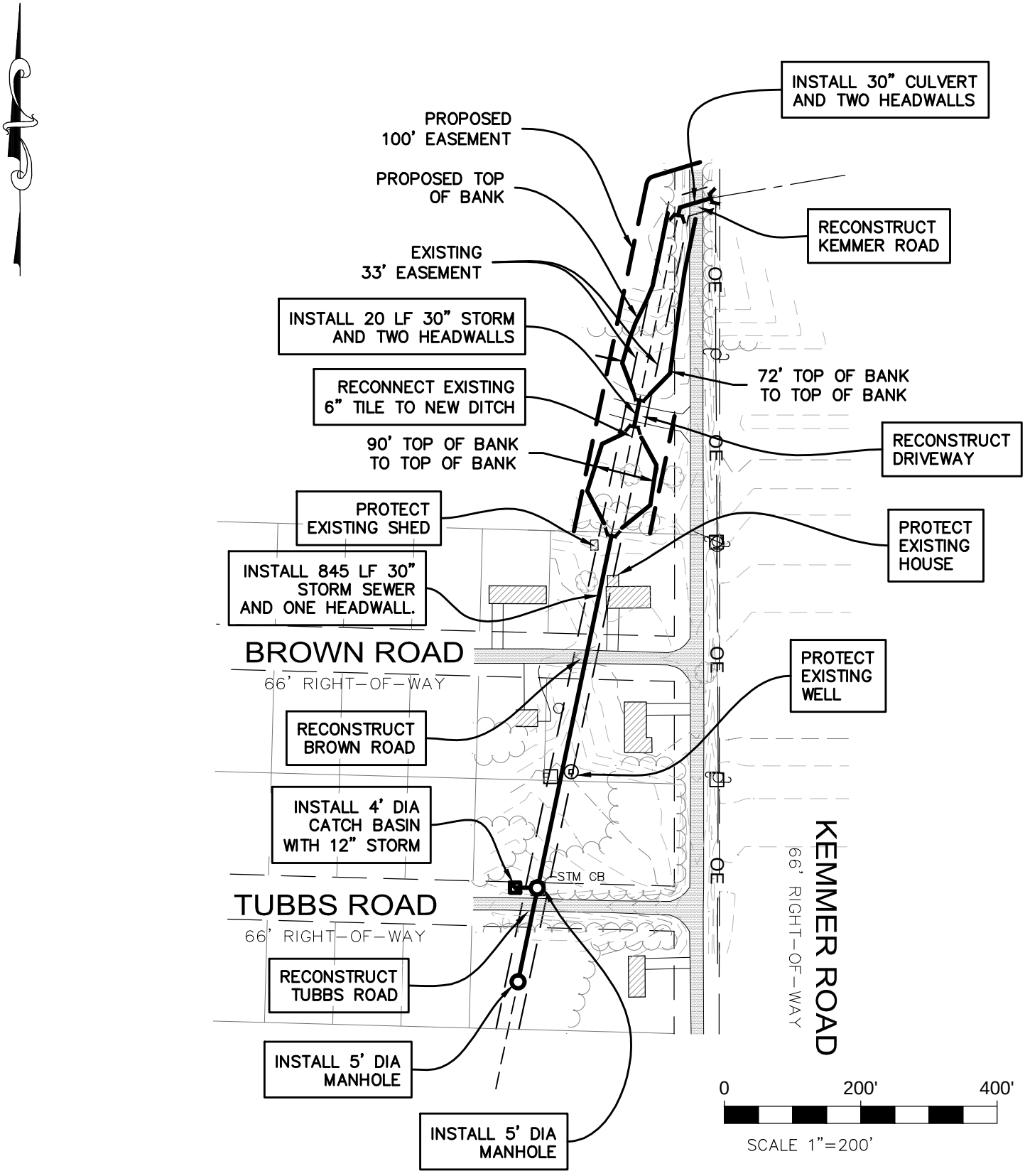

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FIGURE 5
MCGUINEAS & CROMMER DRAIN
ALTERNATE 1B
NEW DITCH/ NEW PIPE
EXISTING ALIGNMENT

DWG: SPS	CHKD: KRK
CLIENT: MCDC PROJECT: MCGUINEAS DRAIN	
SCALE: 1"=200'	
DATE: 7/26/2012	SHEET: 1 of 1

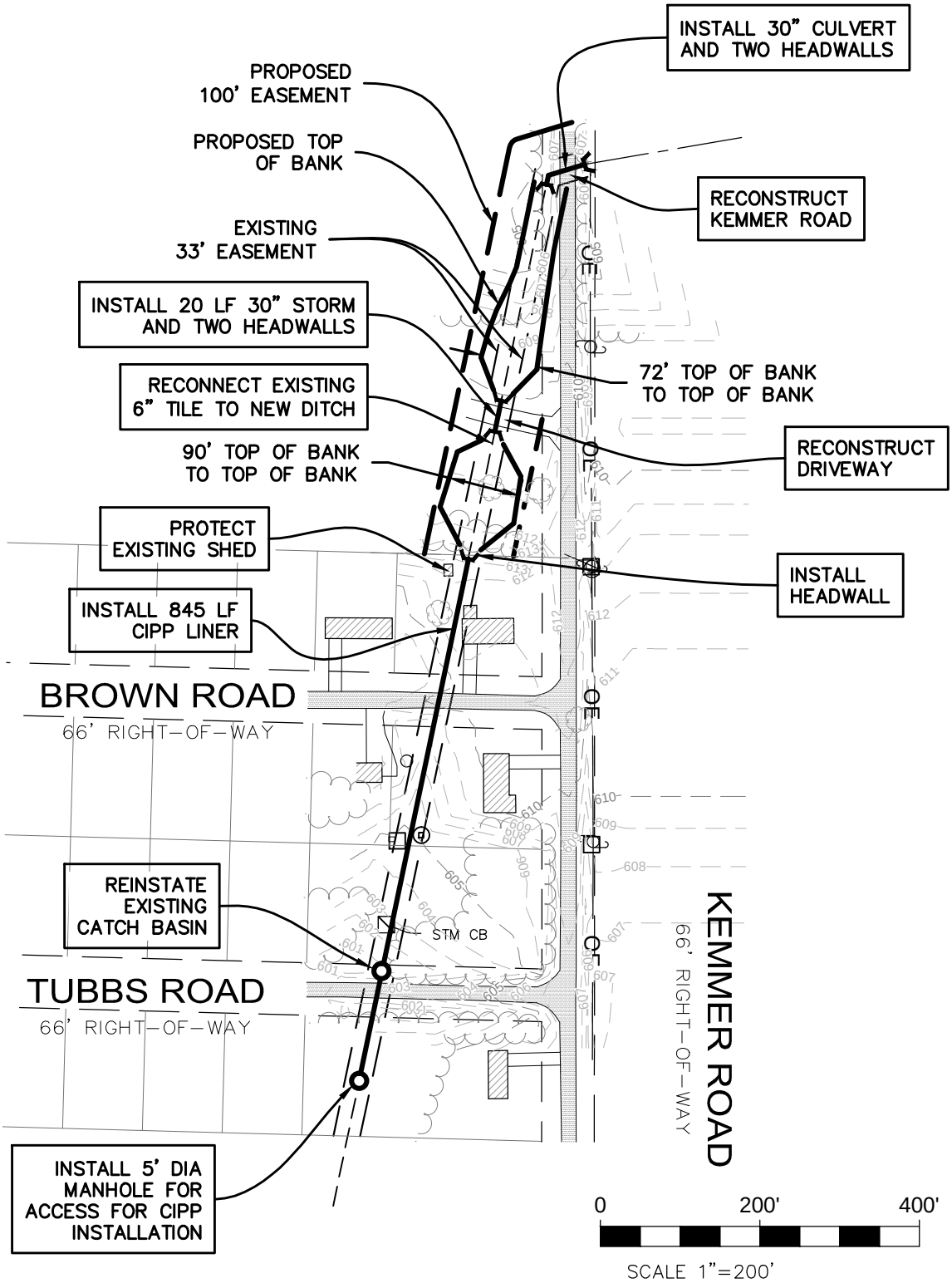

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FIGURE 6
MCGUINEAS & CROMMER DRAIN
ALTERNATE 1C
NEW DITCH/ CIPP LINER
EXISTING ALIGNMENT

DWG: SPS	CHKD: KRK
CLIENT: MCDC PROJECT: MCGUINEAS DRAIN	
SCALE: 1"=200'	
DATE: 7/26/2012	SHEET: 1 of 1

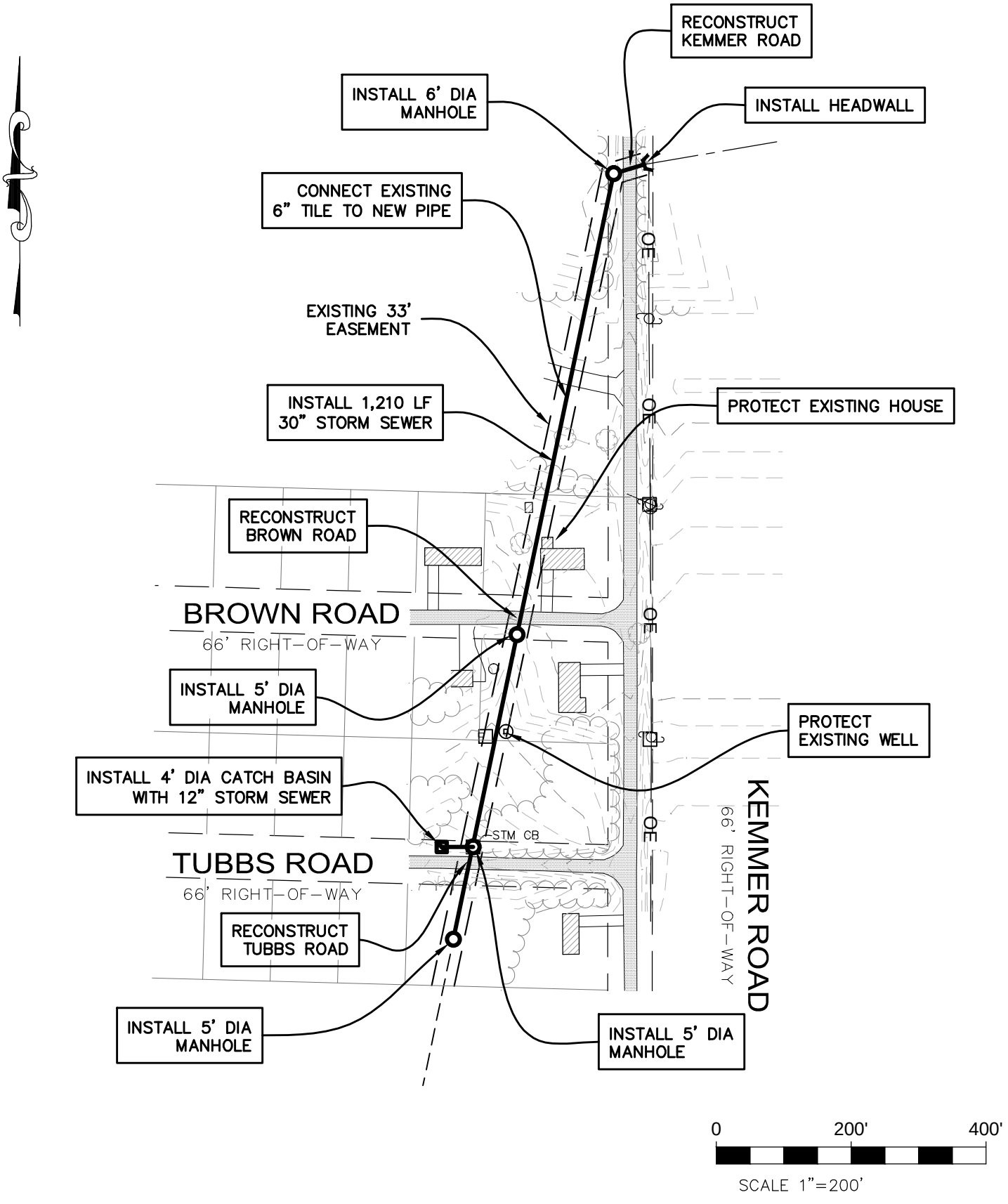

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FIGURE 7
MCGUINEAS & CROMMER DRAIN
ALTERNATE 1D
NEW PIPE
EXISTING ALIGNMENT

DWG: SPS	CHKD: KRK
CLIENT: MCDC PROJECT: MCGUINEAS DRAIN	
SCALE: 1"=200'	
DATE: 7/26/2012	SHEET: 1 of 1

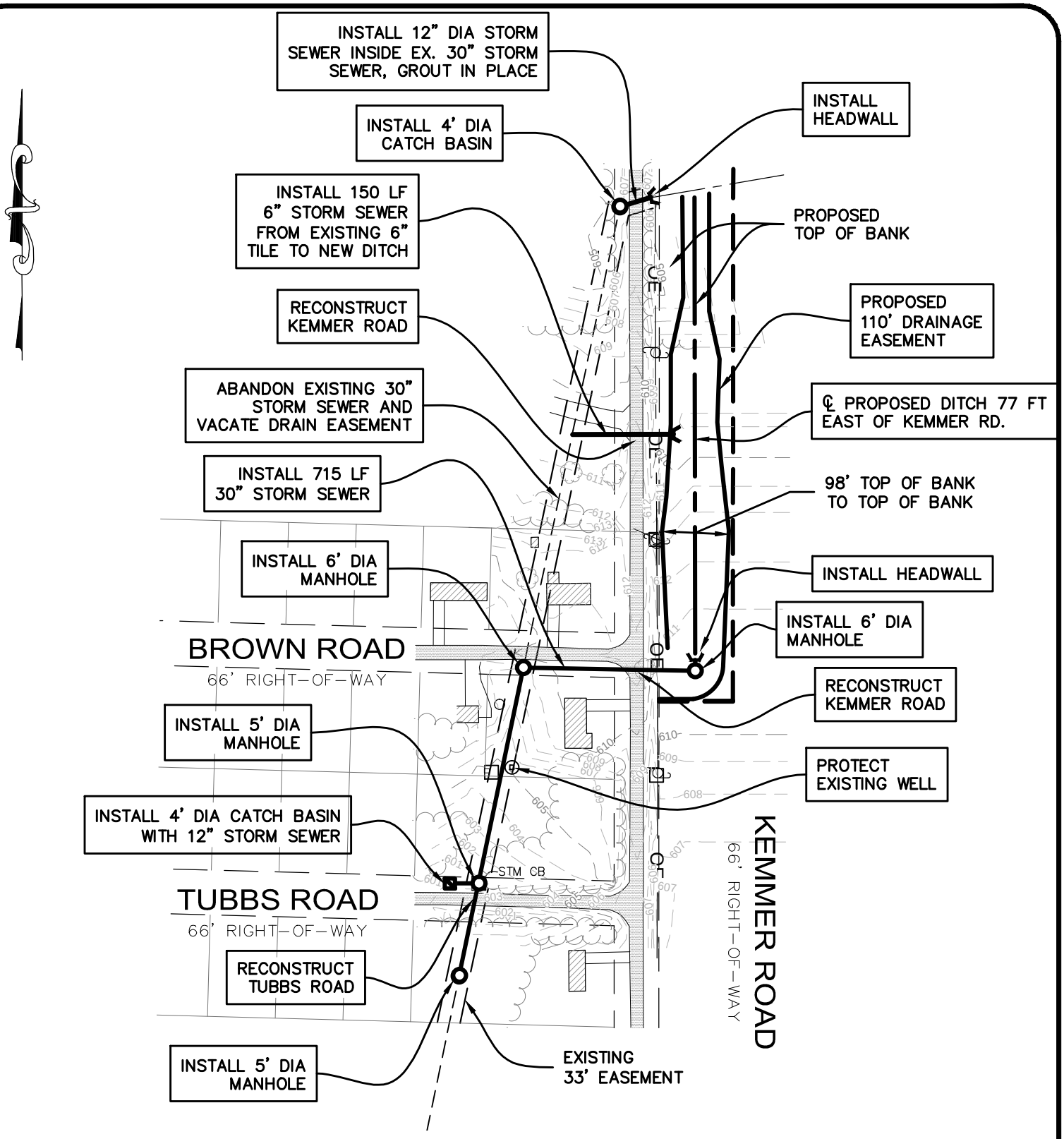

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FIGURE 8
MCGUINEAS & CROMMER DRAIN
ALTERNATE 2A
NEW DITCH / NEW PIPE
KEMMER/BROWN ALIGNMENT

DWG: SPS	CHKD: KRK
CLIENT: MCDC PROJECT: MCGUINEAS DRAIN	
SCALE: 1"=200'	
DATE: 7/26/2012	SHEET: 1 of 1

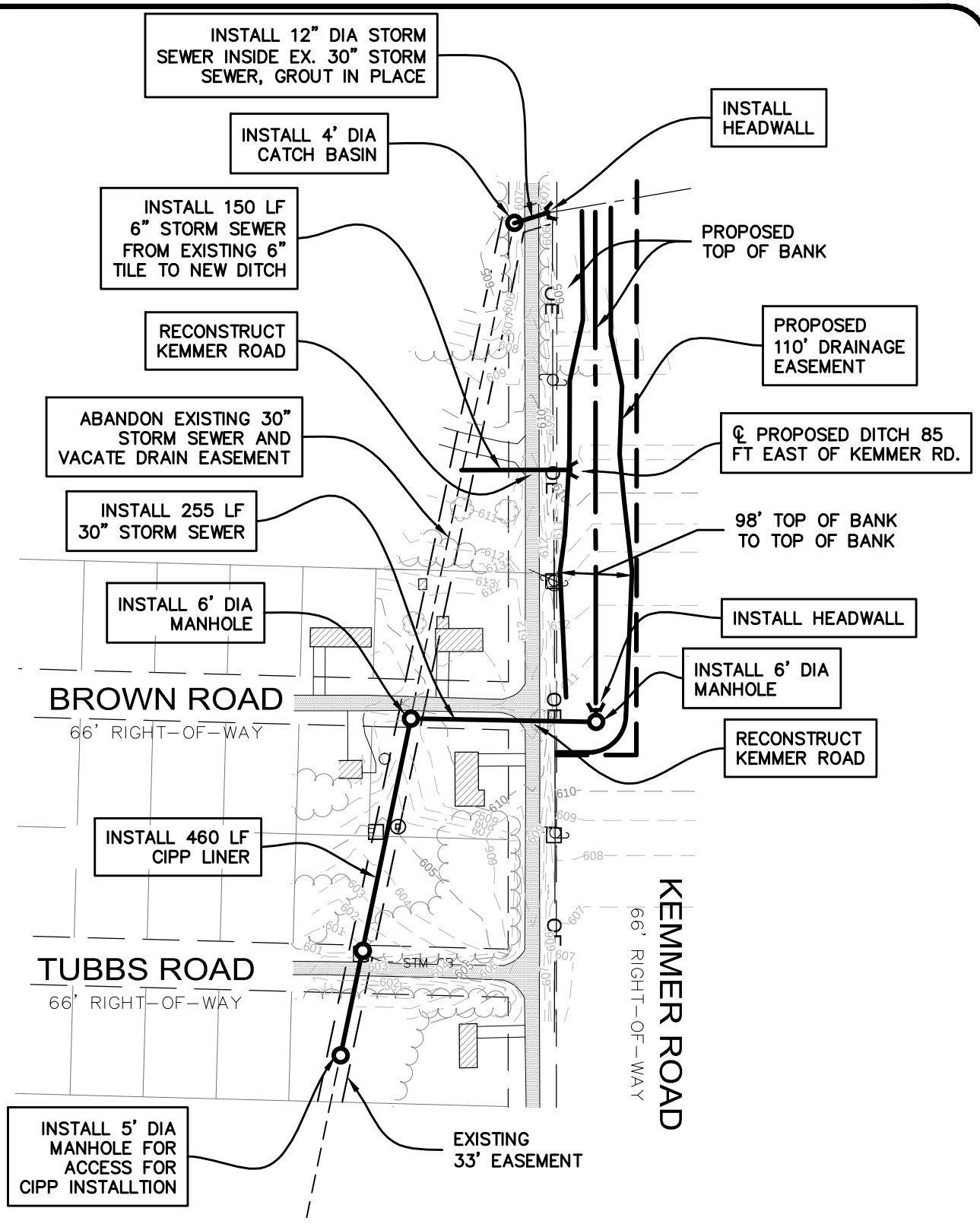

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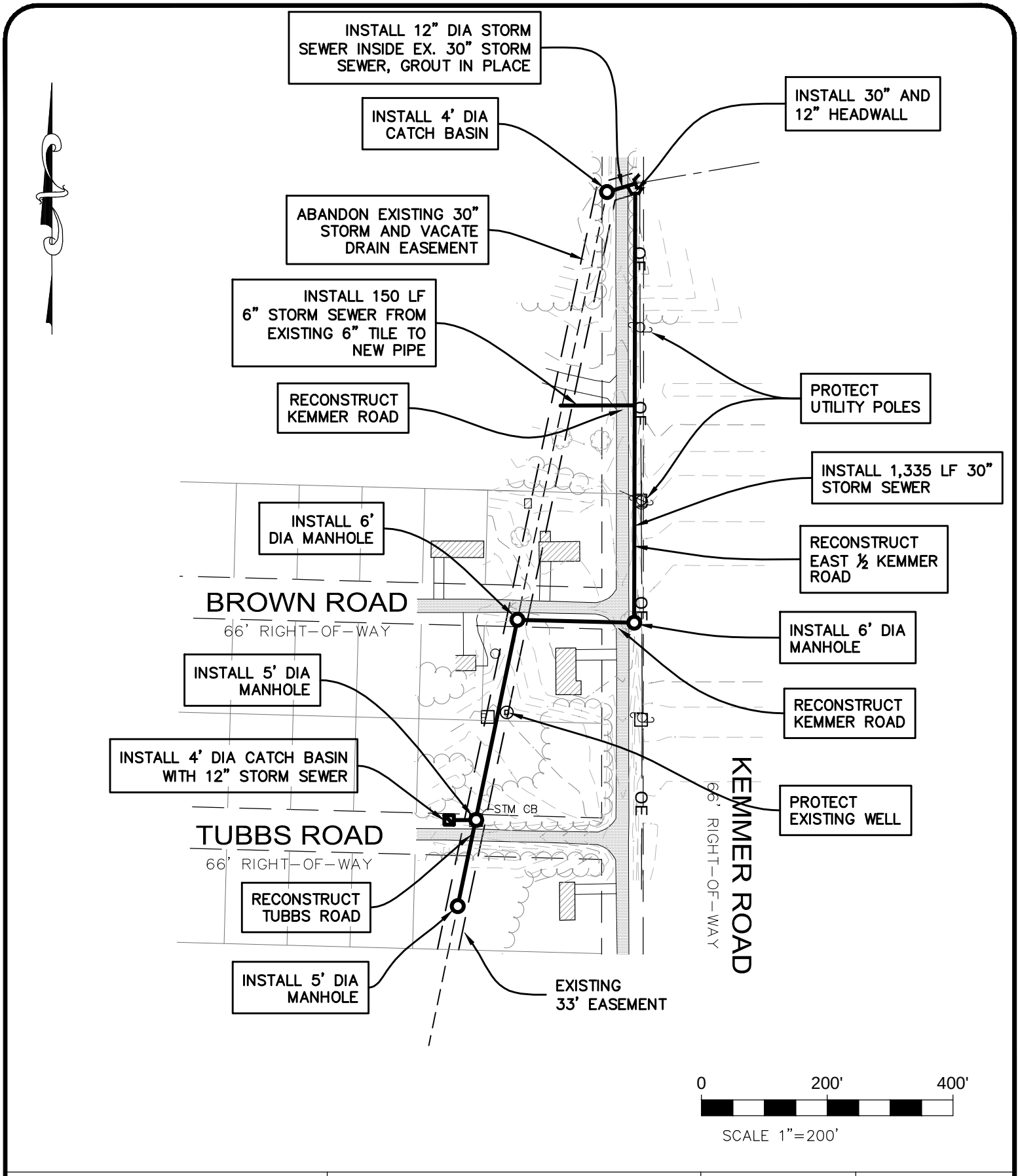
FIGURE 9
MCGUINEAS & CROMMER DRAIN
ALTERNATE 2B
NEW DITCH / CIPP LINER
KEMMER/BROWN ALIGNMENT

DWG: SPS	CHKD: KRK
CLIENT: MCDC PROJECT: MCGUINEAS DRAIN	
SCALE: 1"=200'	
DATE: 7/26/2012	SHEET: 1 of 1



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Ph: (517) 853-7866

FIGURE 10
MCGUINEAS & CROMMER DRAIN
ALTERNATE 2C
NEW PIPE
KEMMER/BROWN ALIGNMENT

DWG: SPS	CHKD: KRK
CLIENT: MCDC PROJECT: MCGUINEAS DRAIN	
SCALE: 1"=200'	
DATE: 7/26/2012	SHEET: 1 of 1

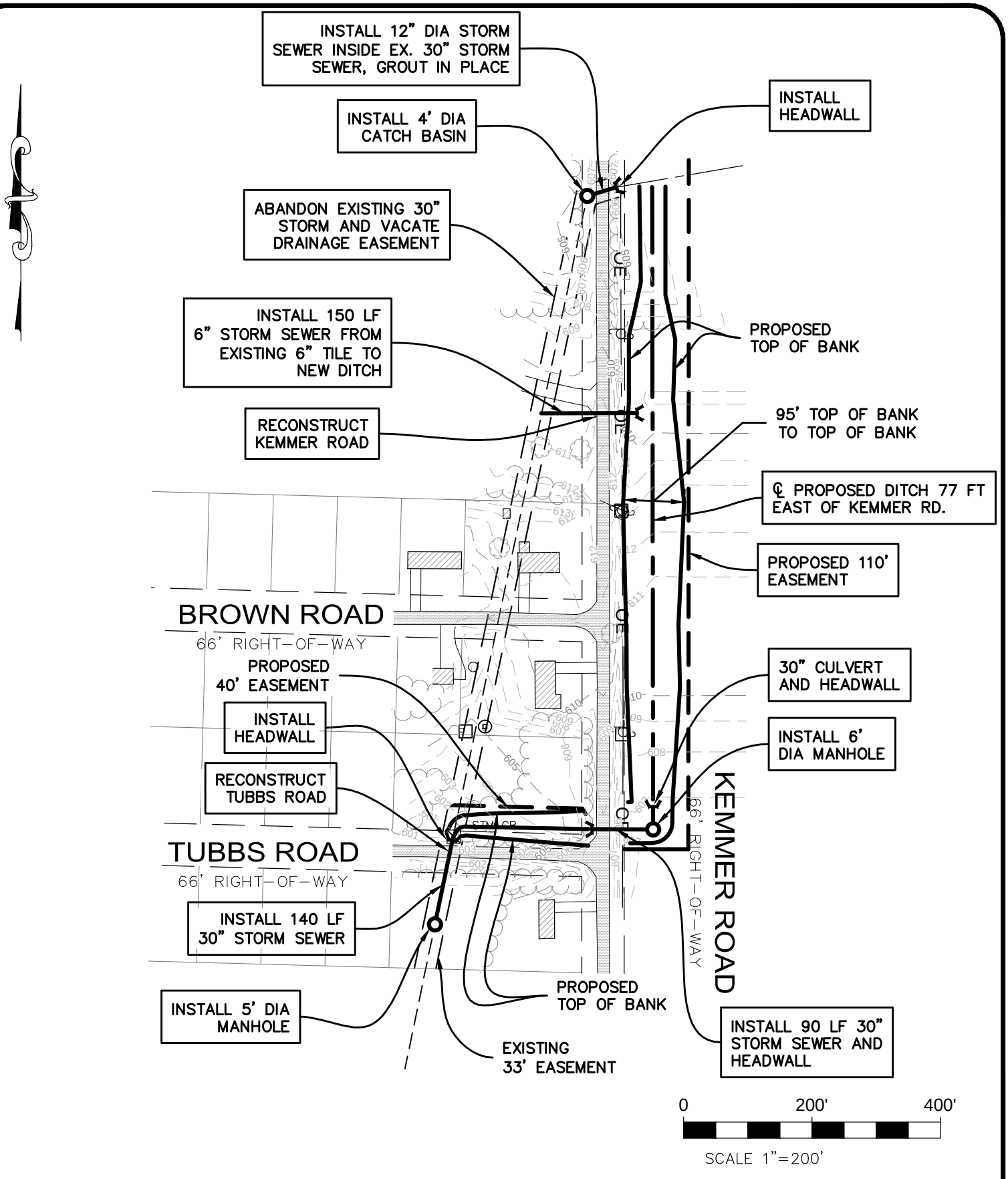

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FIGURE 11
MCGUINEAS & CROMMER DRAIN
ALTERNATE 3A
NEW DITCH/NEW PIPE
KEMMER/TUBBS ALIGNMENT

DWG: SPS	CHKD: KRK
CLIENT: MCDC PROJECT: MCGUINEAS DRAIN	
SCALE: 1"=200'	
DATE: 7/26/2012	SHEET: 1 of 1

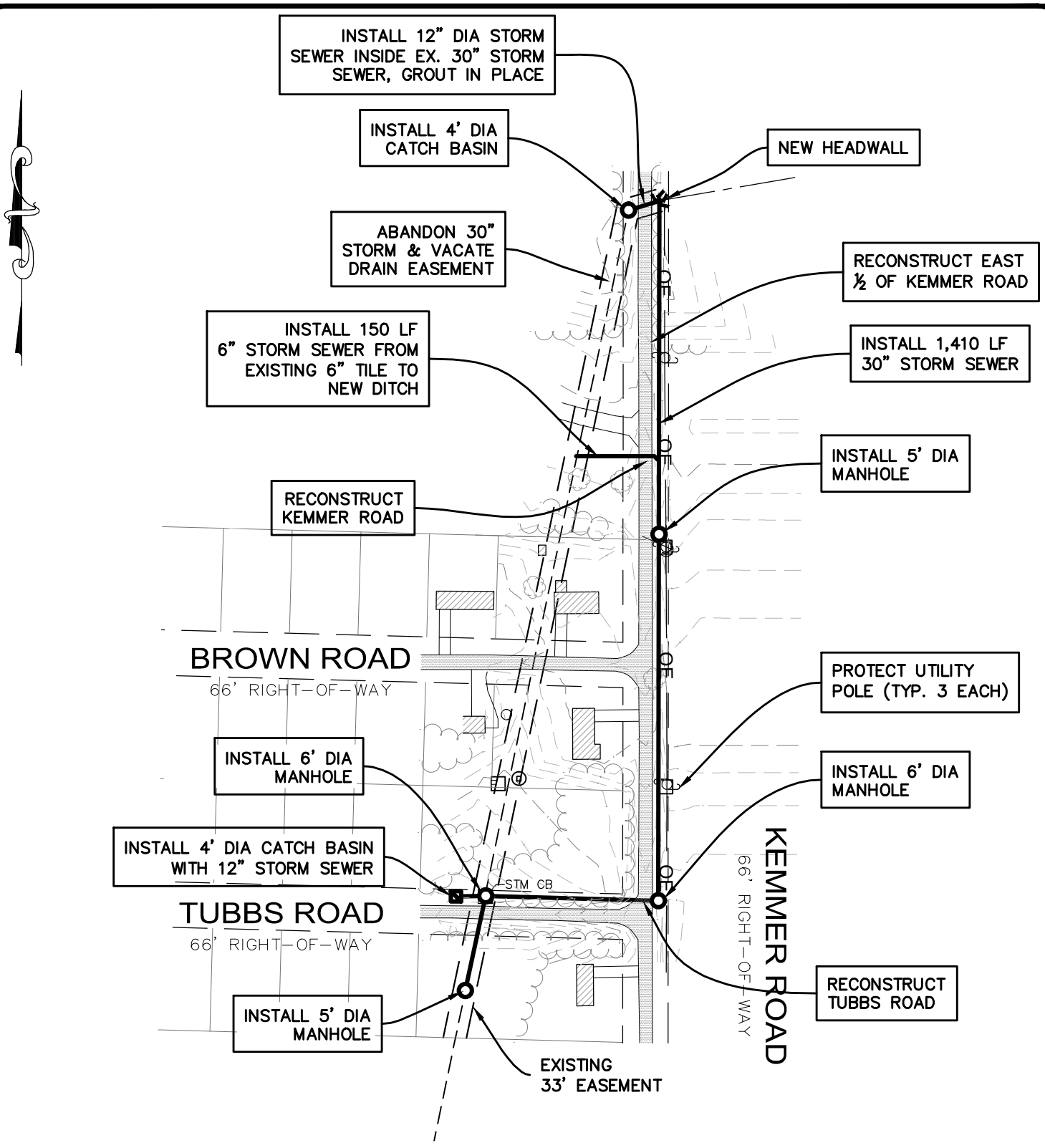

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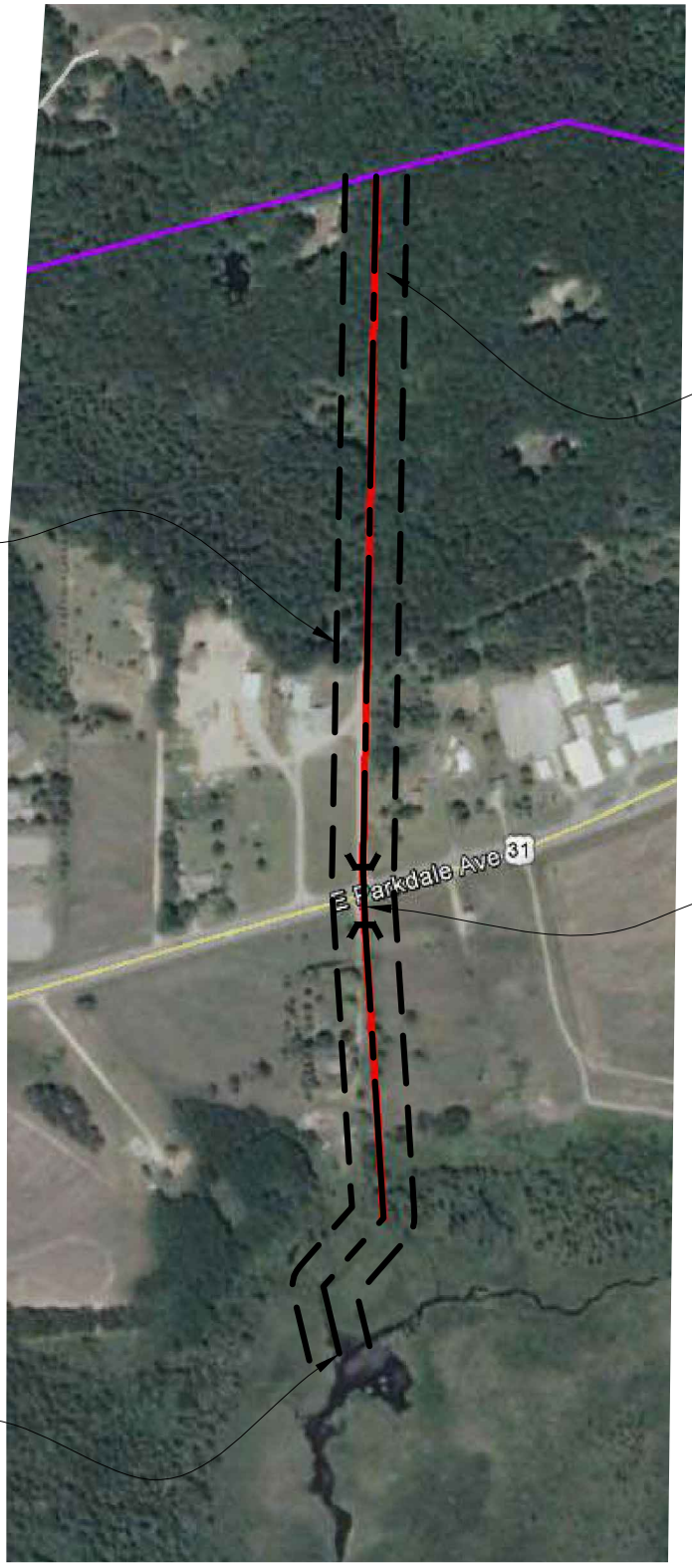
FIGURE 12
MCGUINEAS & CROMMER DRAIN
ALTERNATE 3B
NEW PIPE
KEMMER/TUBBS ALIGNMENT

DWG: SPS	CHKD: KRK
CLIENT: MCDC PROJECT: MCGUINEAS DRAIN	
SCALE: 1"=200'	
DATE: 7/26/2012	SHEET: 1 of 1



MDEQ WETLAND PERMIT

PROPOSED 150 FT EASEMENT

72" CULVERT WITH HEADWALL UNDER US 31 (MDOT PERMIT REQUIRED)

CONSTRUCT DRAIN OUTLET AT MANISTEE RIVER (MDEQ FLOOD PLAIN AND WETLAND PERMIT REQUIRED)

0 500' 1000'

SCALE 1"=500'

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FIGURE 13
MCGUINEAS & CROMMER DRAIN
ALTERNATE 4A
NEW DITCH
½ MILE EAST OF KEMMER

DWG: SPS	CHKD: KRK
CLIENT: MCDC PROJECT: MCGUINEAS DRAIN	
SCALE: 1"=500'	
DATE: 7/26/2012	SHEET: 1 of 1

APPENDIX A

TELEVISED INSPECTION

OPERATOR LOGS

TV Inspection Report
With Grading

MH ACCESS 1 to INLET
Upstream Inspection

PSR	PO Number	Status	Date	Time	Weather
1		Completed	08/25/2011	09:26:41	Damp

Street	City	Owner
KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	

Customer	Surveyor Name	Cert #	Length Surveyed	Total Length
	David Ferris	Cobra 23	73.7	0.0

Location Code	Location Details	Ht/Dia	Width	Shape	Material	Pre-Cleaning	Date Cleaned	Sewer Use
		32	0	Circular	RCP	No Pre-...		SW

Upstream MH	US Rim to Inv	US Grd to Inv	US Rim to Grd	Downstream MH	DS Rim to Inv	DS Grd to Inv	DS Rim to Grd
INLET	0.000	0.000	0.000	ACCESS 1	0.000	0.000	0.000

Direction	Flow Control	Drainage Area	Lining Method	Joint Length	Year Laid	Year Renewed	Sewer Category
Upstream	Not Contr...			0.0	0	0	

Video Name	Media Label	Additional Info	Purpose	Sheet
1_8_25_2011.mpg	None			1

Footage	Code	CD	Observation	At	To	V1	V2	%	St	O&M	Jt	Remarks	Img
			<Start Inspection>										
0.0	AOC		Special Chamber										
0.0	MWL		Water Level					5					
20.8	H	S01	Hole	5	7				5				
27.6	B		Broken	8	12				5				
54.2	MWL		Water Level					20					
71.6	LR		Alignment Right					90		4			
73.7	H	F01	Hole	5	7				5				
			<Complete Inspection>										

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TV Inspection Report
With Grading

MH ACCESS 1 to INLET
Upstream Inspection

PSR	PO Number	Status	Date	Time	Weather
1		Completed	08/25/2011	09:26:41	Damp

Street	City	Owner
KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	

Customer	Surveyor Name	Cert #	Length Surveyed	Total Length
	David Ferris	Cobra 23	73.7	0.0

Location Code	Location Details	Ht/Dia	Width	Shape	Material	Pre-Cleaning	Date Cleaned	Sewer Use
		32	0	Circular	RCP	No Pre-...		SW

Upstream MH	US Rim to Inv	US Grd to Inv	US Rim to Grd	Downstream MH	DS Rim to Inv	DS Grd to Inv	DS Rim to Grd
INLET	0.000	0.000	0.000	ACCESS 1	0.000	0.000	0.000

Direction	Flow Control	Drainage Area	Lining Method	Joint Length	Year Laid	Year Renewed	Sewer Category
Upstream	Not Contr...			0.0	0	0	

Video Name	Media Label	Additional Info	Purpose	Sheet
1_8_25_2011.mpg	None			2

Structural

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	0	12	60.0	5A00	5.0

O&M

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	1	0	4.0	4100	4.0

Overall

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	1	12	64.0	5A41	4.9

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TV Inspection Report
With Grading

MH ACCESS 1 to BROWN RD
Downstream Inspection

PSR	PO Number	Status	Date	Time	Weather
2		Completed	08/25/2011	09:39:00	Damp

Street	City	Owner
KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	

Customer	Surveyor Name	Cert #	Length Surveyed	Total Length
	David Ferris	Cobra 23	770.5	0.0

Location Code	Location Details	Ht/Dia	Width	Shape	Material	Pre-Cleaning	Date Cleaned	Sewer Use
		32	0	Circular	RCP	No Pre-...		SW

Upstream MH	US Rim to Inv	US Grd to Inv	US Rim to Grd	Downstream MH	DS Rim to Inv	DS Grd to Inv	DS Rim to Grd
ACCESS 1	0.000	0.000	0.000	BROWN RD	0.000	0.000	0.000

Direction	Flow Control	Drainage Area	Lining Method	Joint Length	Year Laid	Year Renewed	Sewer Category
Downstream	Not Contr...			0.0	0	0	

Video Name	Media Label	Additional Info	Purpose	Sheet
2_8_25_2011.mpg	None			1

Footage	Code	CD	Observation	At	To	V1	V2	%	St	O&M	Jt	Remarks	Img
			<Start Inspection>										
8.0	AEP		End of Pipe										
8.0	MWL		Water Level					0					
15.7	H		Hole	5	7				5				
30.8	LFZ	S01	Lining Failure Other	5	7								
50.3	FM		Fracture Multiple	10	2				4				
105.2	HVV		Hole Void Visible	3	5				5				
127.3	HVV		Hole Void Visible	5	7				5				
280.0	AOC		Special Chamber										
280.0	TB		Tap Break-in	2		6							
770.5	LFZ	F01	Lining Failure Other	5	7								
			<Complete Inspection>										

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TV Inspection Report
With Grading

MH ACCESS 1 to BROWN RD
Downstream Inspection

PSR	PO Number	Status	Date	Time	Weather
2		Completed	08/25/2011	09:39:00	Damp

Street	City	Owner
KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	

Customer	Surveyor Name	Cert #	Length Surveyed	Total Length
	David Ferris	Cobra 23	770.5	0.0

Location Code	Location Details	Ht/Dia	Width	Shape	Material	Pre-Cleaning	Date Cleaned	Sewer Use
		32	0	Circular	RCP	No Pre-...		SW

Upstream MH	US Rim to Inv	US Grd to Inv	US Rim to Grd	Downstream MH	DS Rim to Inv	DS Grd to Inv	DS Rim to Grd
ACCESS 1	0.000	0.000	0.000	BROWN RD	0.000	0.000	0.000

Direction	Flow Control	Drainage Area	Lining Method	Joint Length	Year Laid	Year Renewed	Sewer Category
Downstream	Not Contr...			0.0	0	0	

Video Name	Media Label	Additional Info	Purpose	Sheet
2_8_25_2011.mpg	None			2

Structural

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	1	3	19.0	5341	4.8

O&M

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	0	0	0.0	0000	0.0

Overall

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	1	3	19.0	5341	4.8

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TV Inspection Report
With Grading

MH OUT FALL to TUBBS RD
Upstream Inspection

PSR	PO Number	Status	Date	Time	Weather
3		Completed	08/25/2011	10:47:03	Damp

Street	City	Owner
KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	

Customer	Surveyor Name	Cert #	Length Surveyed	Total Length
	David Ferris	Cobra 23	164.1	0.0

Location Code	Location Details	Ht/Dia	Width	Shape	Material	Pre-Cleaning	Date Cleaned	Sewer Use
		32	0	Circular	VCP	No Pre-...		SW

Upstream MH	US Rim to Inv	US Grd to Inv	US Rim to Grd	Downstream MH	DS Rim to Inv	DS Grd to Inv	DS Rim to Grd
TUBBS RD	0.000	0.000	0.000	OUT FALL	0.000	0.000	0.000

Direction	Flow Control	Drainage Area	Lining Method	Joint Length	Year Laid	Year Renewed	Sewer Category
Upstream	Not Contr...			0.0	0	0	

Video Name	Media Label	Additional Info	Purpose	Sheet
3_8_25_2011.mpg	None			1

Footage	Code	CD	Observation	At	To	V1	V2	%	St	O&M	Jt	Remarks	Img
			<Start Inspection>										
8.0	AEP		End of Pipe										
8.0	MWL		Water Level					5					
139.4	TBI		Tap Break-in Intruding	2		12	12			2			
164.1	ACB		Catch Basin										
			<Complete Inspection>										

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TV Inspection Report
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MH OUT FALL to TUBBS RD
Upstream Inspection

PSR	PO Number	Status	Date	Time	Weather
3		Completed	08/25/2011	10:47:03	Damp

Street	City	Owner
KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	

Customer	Surveyor Name	Cert #	Length Surveyed	Total Length
	David Ferris	Cobra 23	164.1	0.0

Location Code	Location Details	Ht/Dia	Width	Shape	Material	Pre-Cleaning	Date Cleaned	Sewer Use
		32	0	Circular	VCP	No Pre-...		SW

Upstream MH	US Rim to Inv	US Grd to Inv	US Rim to Grd	Downstream MH	DS Rim to Inv	DS Grd to Inv	DS Rim to Grd
TUBBS RD	0.000	0.000	0.000	OUT FALL	0.000	0.000	0.000

Direction	Flow Control	Drainage Area	Lining Method	Joint Length	Year Laid	Year Renewed	Sewer Category
Upstream	Not Contr...			0.0	0	0	

Video Name	Media Label	Additional Info	Purpose	Sheet
3_8_25_2011.mpg	None			2

Structural

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	0	0	0.0	0000	0.0

O&M

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	1	0	0	0	2.0	2100	2.0

Overall

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	1	0	0	0	2.0	2100	2.0

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TV Inspection Report
With Grading

MH TUBBS RD to OUT FALL
Downstream Inspection

PSR	PO Number	Status	Date	Time	Weather
4		Completed	08/25/2011	11:39:46	Damp

Street	City	Owner
KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	

Customer	Surveyor Name	Cert #	Length Surveyed	Total Length
	David Ferris	Cobra 23	1286.9	0.0

Location Code	Location Details	Ht/Dia	Width	Shape	Material	Pre-Cleaning	Date Cleaned	Sewer Use
		32	0	Circular	RCP	No Pre-...		SW

Upstream MH	US Rim to Inv	US Grd to Inv	US Rim to Grd	Downstream MH	DS Rim to Inv	DS Grd to Inv	DS Rim to Grd
TUBBS RD	0.000	0.000	0.000	OUT FALL	0.000	0.000	0.000

Direction	Flow Control	Drainage Area	Lining Method	Joint Length	Year Laid	Year Renewed	Sewer Category
Downstream	Not Contr...			0.0	0	0	

Video Name	Media Label	Additional Info	Purpose	Sheet
4_8_25_2011.mpg	None			1

Footage	Code	CD	Observation	At	To	V1	V2	%	St	O&M	Jt	Remarks	Img
			<Start Inspection>										
8.0	ACB		Catch Basin										
8.0	MWL		Water Level					0					
19.3	B		Broken	7	5				5				
34.2	H		Hole	5	7				5				
202.7	RFJ		Roots Fine Joint	5	7					1	Jt		
559.9	RFJ		Roots Fine Joint	7	5					1	Jt		
749.8	ACB		Catch Basin										
749.8	TB		Tap Break-in	2		8							
894.5	TB		Tap Break-in	11		4							
1240.3	TB		Tap Break-in	10		6							
1275.1	TB		Tap Break-in	11		8							
			<Compiete Inspection>										

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TV Inspection Report
With Grading

MH TUBBS RD to OUT FALL
Downstream Inspection

PSR	PO Number	Status	Date	Time	Weather
4		Completed	08/25/2011	11:39:46	Damp

Street	City	Owner
KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	

Customer	Surveyor Name	Cert #	Length Surveyed	Total Length
	David Ferris	Cobra 23	1286.9	0.0

Location Code	Location Details	Ht/Dia	Width	Shape	Material	Pre-Cleaning	Date Cleaned	Sewer Use
		32	0	Circular	RCP	No Pre-...		SW

Upstream MH	US Rim to Inv	US Grd to Inv	US Rim to Grd	Downstream MH	DS Rim to Inv	DS Grd to Inv	DS Rim to Grd
TUBBS RD	0.000	0.000	0.000	OUT FALL	0.000	0.000	0.000

Direction	Flow Control	Drainage Area	Lining Method	Joint Length	Year Laid	Year Renewed	Sewer Category
Downstream	Not Contr...			0.0	0	0	

Video Name	Media Label	Additional Info	Purpose	Sheet
4_8_25_2011.mpg	None			2

Structural

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	0	2	10.0	5200	5.0

O&M

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
2	0	0	0	0	2.0	1200	1.0

Overall

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
2	0	0	0	2	12.0	5212	3.0

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TV Inspection Report
With Grading

MH ACCESS to TUBBS RD
Upstream Inspection

PSR	PO Number	Status	Date	Time	Weather
5		Completed	08/25/2011	12:59:17	Damp

Street	City	Owner
KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	

Customer	Surveyor Name	Cert #	Length Surveyed	Total Length
	David Ferris	Cobra 23	113.6	0.0

Location Code	Location Details	Ht/Dia	Width	Shape	Material	Pre-Cleaning	Date Cleaned	Sewer Use
		32	0	Circular	RCP	No Pre-...		SW

Upstream MH	US Rim to Inv	US Grd to Inv	US Rim to Grd	Downstream MH	DS Rim to Inv	DS Grd to Inv	DS Rim to Grd
TUBBS RD	0.000	0.000	0.000	ACCESS	0.000	0.000	0.000

Direction	Flow Control	Drainage Area	Lining Method	Joint Length	Year Laid	Year Renewed	Sewer Category
Upstream	Not Contr...			0.0	0	0	

Video Name	Media Label	Additional Info	Purpose	Sheet
5_8_25_2011.mpg	None			1

Footage	Code	CD	Observation	At	To	V1	V2	%	St	O&M	Jt	Remarks	Img
			<Start Inspection>										
8.0	ACB		Catch Basin										
8.0	MWL		Water Level					0					
36.9	HSV		Hole Soil Visible	3	9				5				
101.3	B		Broken	12	12				5				
113.6	DSF		Deposits Settled Fine	4	8			25		4			
			<Complete Inspection>										

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TV Inspection Report
With Grading

MH ACCESS to TUBBS RD
Upstream Inspection

PSR	PO Number	Status	Date	Time	Weather
5		Completed	08/25/2011	12:59:17	Damp

Street	City	Owner
KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	

Customer	Surveyor Name	Cert #	Length Surveyed	Total Length
	David Ferris	Cobra 23	113.6	0.0

Location Code	Location Details	Ht/Dia	Width	Shape	Material	Pre-Cleaning	Date Cleaned	Sewer Use
		32	0	Circular	RCP	No Pre-...		SW

Upstream MH	US Rim to Inv	US Grd to Inv	US Rim to Grd	Downstream MH	DS Rim to Inv	DS Grd to Inv	DS Rim to Grd
TUBBS RD	0.000	0.000	0.000	ACCESS	0.000	0.000	0.000

Direction	Flow Control	Drainage Area	Lining Method	Joint Length	Year Laid	Year Renewed	Sewer Category
Upstream	Not Contr...			0.0	0	0	

Video Name	Media Label	Additional Info	Purpose	Sheet
5_8_25_2011.mpg	None			2

Structural

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	0	2	10.0	5200	5.0

O&M

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	1	0	4.0	4100	4.0

Overall

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Rating	Quick	Index
0	0	0	1	2	14.0	5241	4.7

CIMS v9
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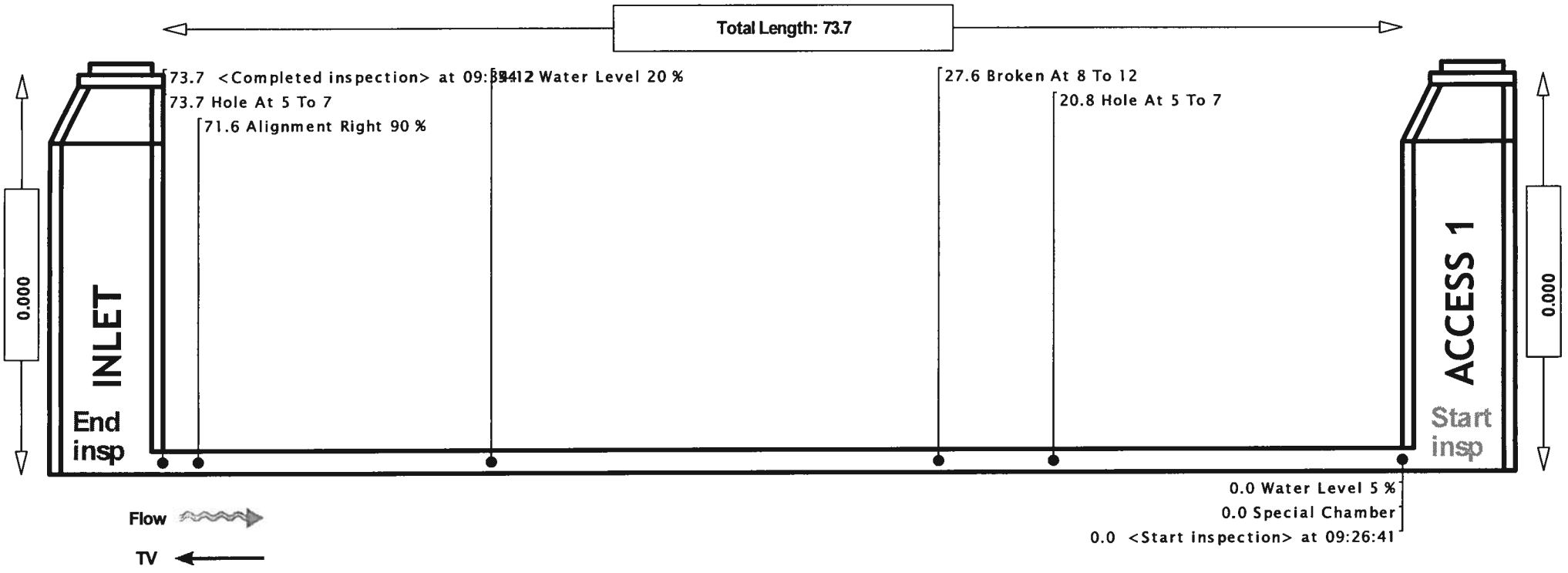
Cross Section Report

MH ACCESS 1 to INLET

Upstream Inspection

PSR	Street	City	Date	Time	Weather
1	KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	08/25/2011	09:26:41	Damp

Ht/Dia	Width	Shape	Material	Length Surveyed	Total Length	Status	Additional Info	Purpose	Sheet	Video Name	
32	0	Circular	RCP	73.7	0.0	Completed			1	1_8_25_2011.mpg	☒



☐ = image attached

☒ = video attached

☒ = uninspected portion

Cobra Information Management Software
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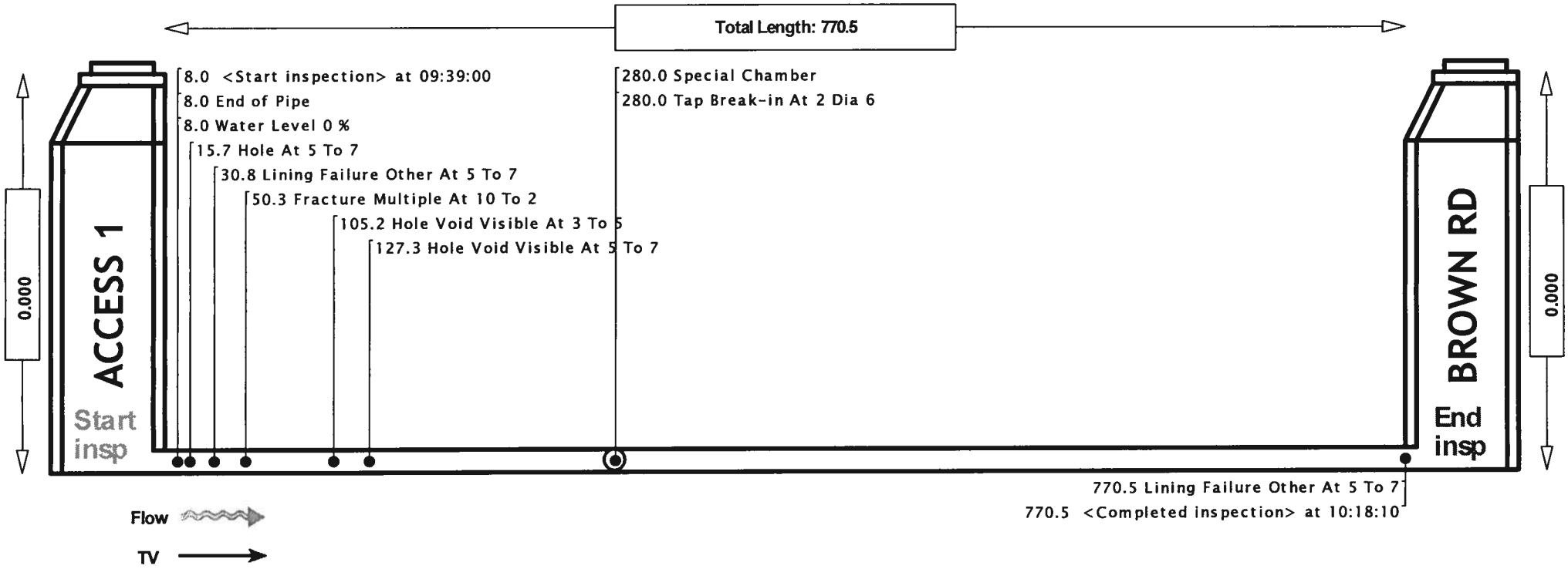
Cross Section Report

MH ACCESS 1 to BROWN RD

Downstream Inspection

PSR	Street	City	Date	Time	Weather
2	KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	08/25/2011	09:39:00	Damp

Ht/Dia	Width	Shape	Material	Length Surveyed	Total Length	Status	Additional Info	Purpose	Sheet	Video Name	
32	0	Circular	RCP	770.5	0.0	Completed			1	2_8_25_2011.mpg	☒



☐ = image attached
☒ = video attached
☒ = uninspected portion

CIMS v9
Cobra Information Management Software
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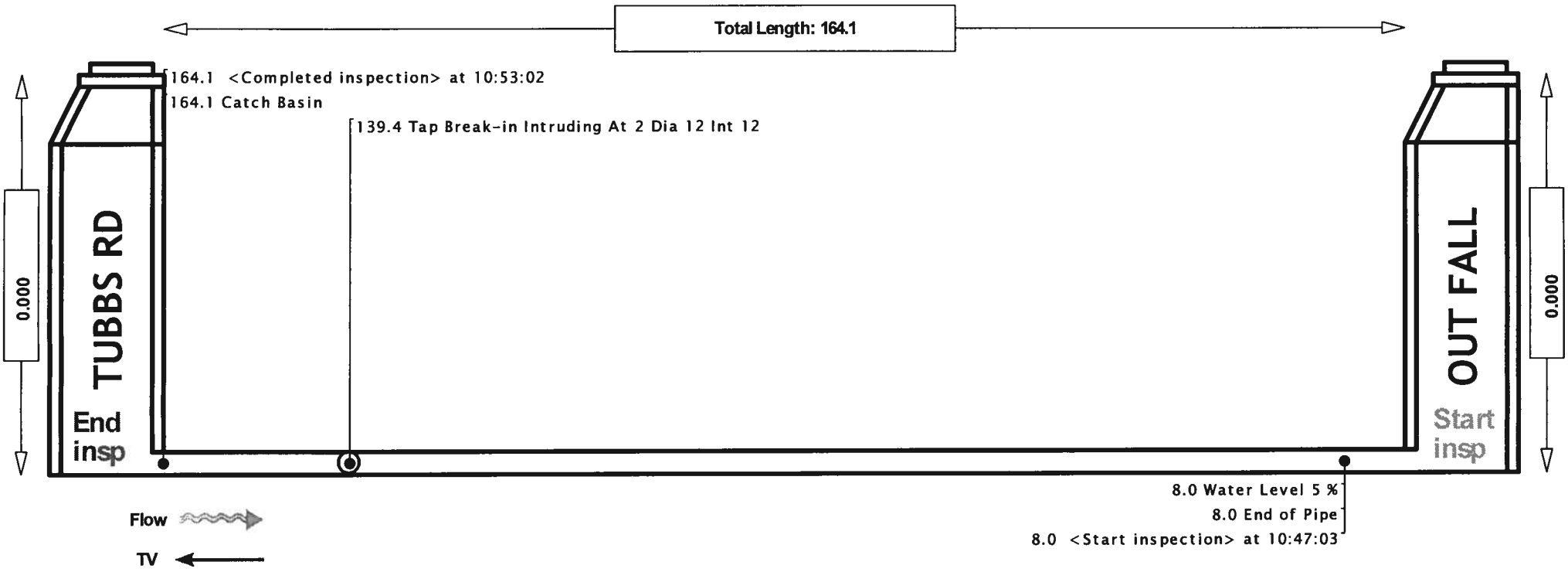
Cross Section Report

MH OUT FALL to TUBBS RD

Upstream Inspection

PSR	Street	City	Date	Time	Weather
3	KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	08/25/2011	10:47:03	Damp

Ht/Dia	Width	Shape	Material	Length Surveyed	Total Length	Status	Additional Info	Purpose	Sheet	Video Name	
32	0	Circular	VCP	164.1	0.0	Completed			1	3_8_25_2011.mpg	☒



☐ = image attached
☒ = video attached
☒ = uninspected portion

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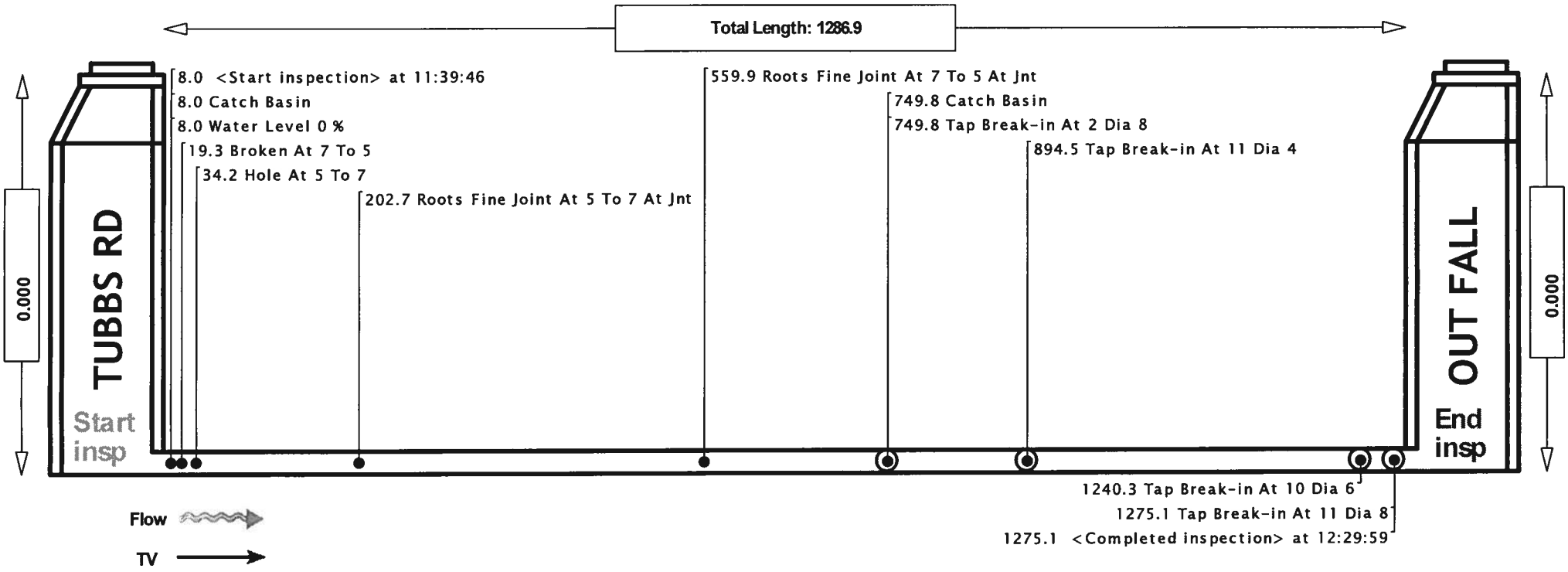
Cross Section Report

MH TUBBS RD to OUT FALL

Downstream Inspection

PSR	Street	City	Date	Time	Weather
4	KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	08/25/2011	11:39:46	Damp

Ht/Dia	Width	Shape	Material	Length Surveyed	Total Length	Status	Additional Info	Purpose	Sheet	Video Name	
32	0	Circular	RCP	1286.9	0.0	Completed			1	4_8_25_2011.mpg	☒



☐ = image attached

☒ = video attached

☒ = uninspected portion

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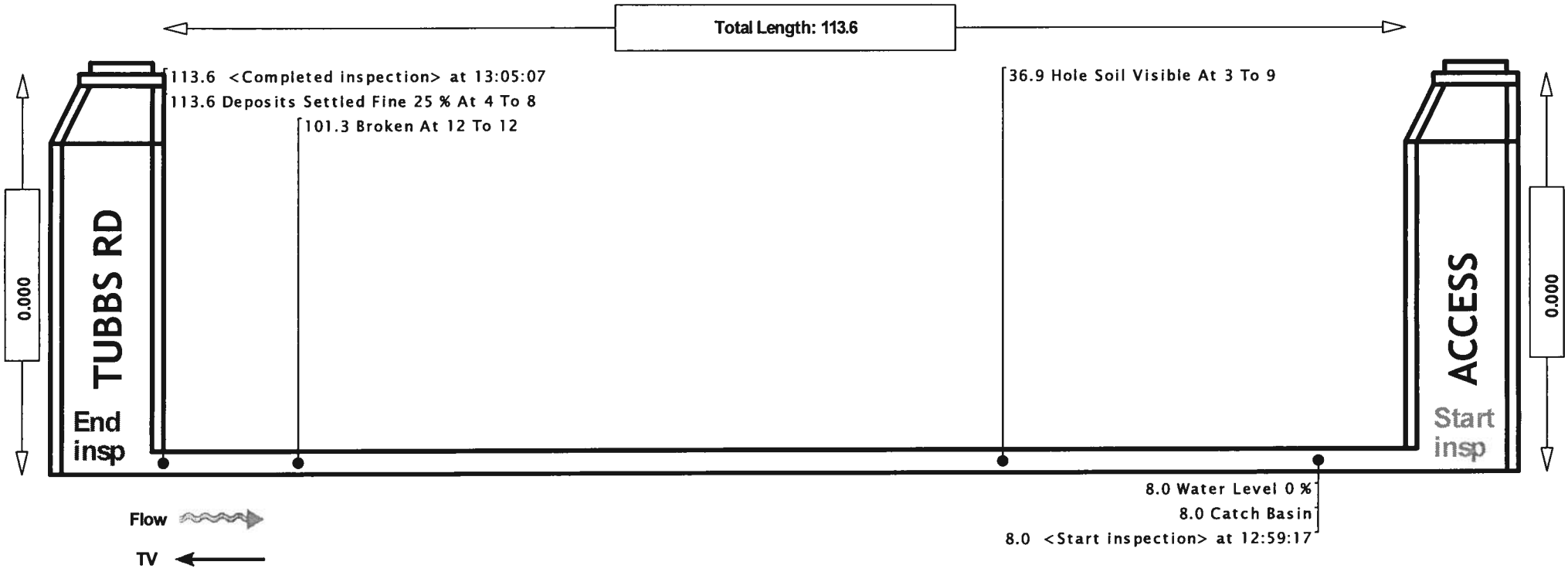
Cross Section Report

MH ACCESS to TUBBS RD

Upstream Inspection

PSR	Street	City	Date	Time	Weather
5	KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN	08/25/2011	12:59:17	Damp

Ht/Dia	Width	Shape	Material	Length Surveyed	Total Length	Status	Additional Info	Purpose	Sheet	Video Name	
32	0	Circular	RCP	113.6	0.0	Completed			1	5_8_25_2011.mpg	☒



☐ = image attached
☒ = video attached
☒ = uninspected portion

CIMS v9
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Plan View Report

MH ACCESS 1 to INLET

Upstream Inspection

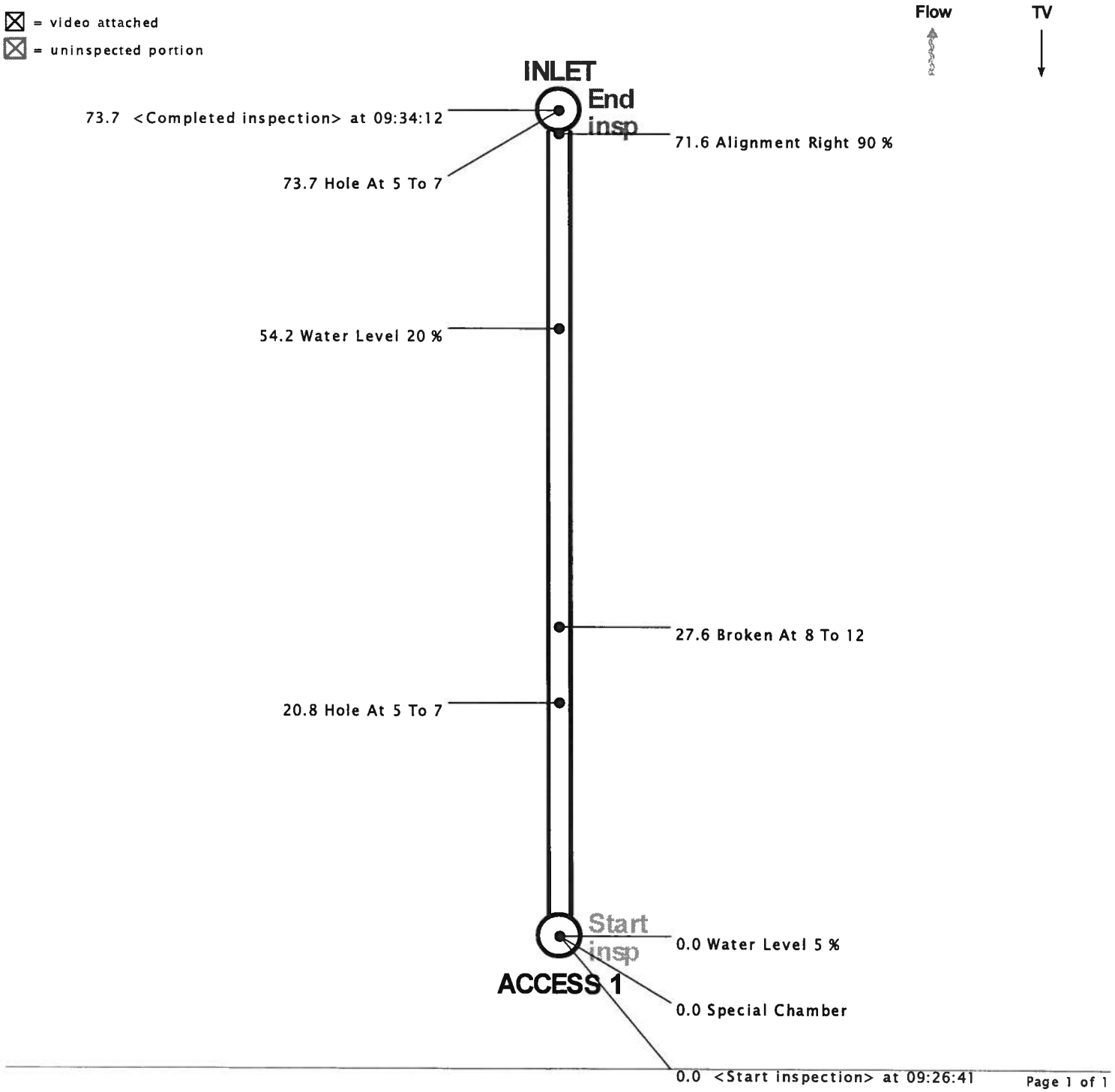
PSR	Street	City
1	KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN

Date	Time	Weather	Ht/Dia	Width	Shape	Material	Length Surveyed	Total Length	Status
08/25/2011	09:26:41	Damp	32	0	Circular	RCP	73.7	0.0	Completed

Video Name	Additional Info	Purpose	Sheet
1_8_25_2011.mpg	☒		1

☒ = video attached

☒ = uninspected portion



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www.cobratec.com

Plan View Report

MH ACCESS 1 to BROWN RD

Downstream Inspection

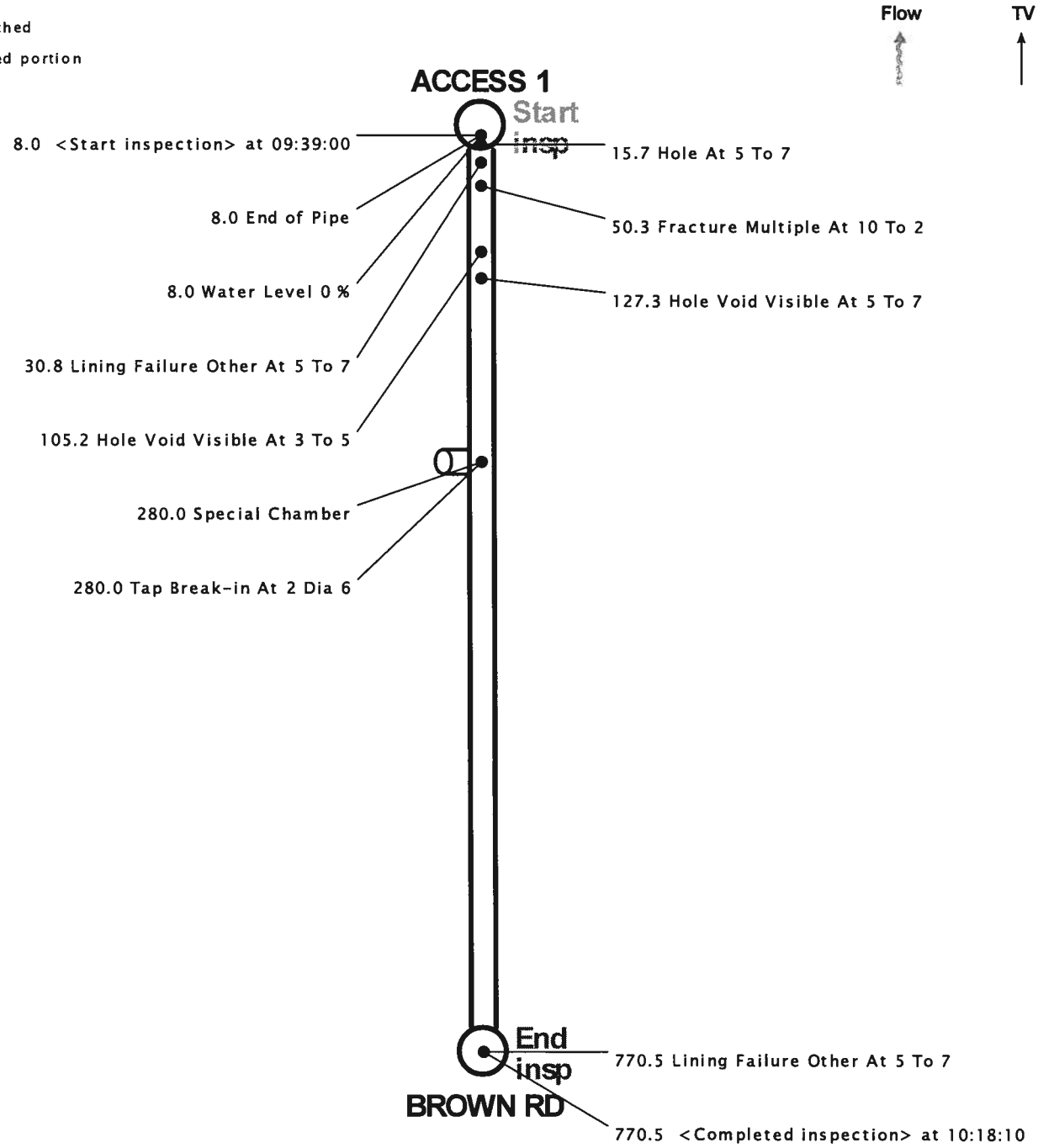
PSR	Street	City
2	KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN

Date	Time	Weather	Ht/Dia	Width	Shape	Material	Length Surveyed	Total Length	Status
08/25/2011	09:39:00	Damp	32	0	Circular	RCP	770.5	0.0	Completed

Video Name	Additional Info	Purpose	Sheet
2_8_25_2011.mpg	☒		1

☒ = video attached

☒ = uninspected portion



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Plan View Report

MH OUT FALL to TUBBS RD

Upstream Inspection

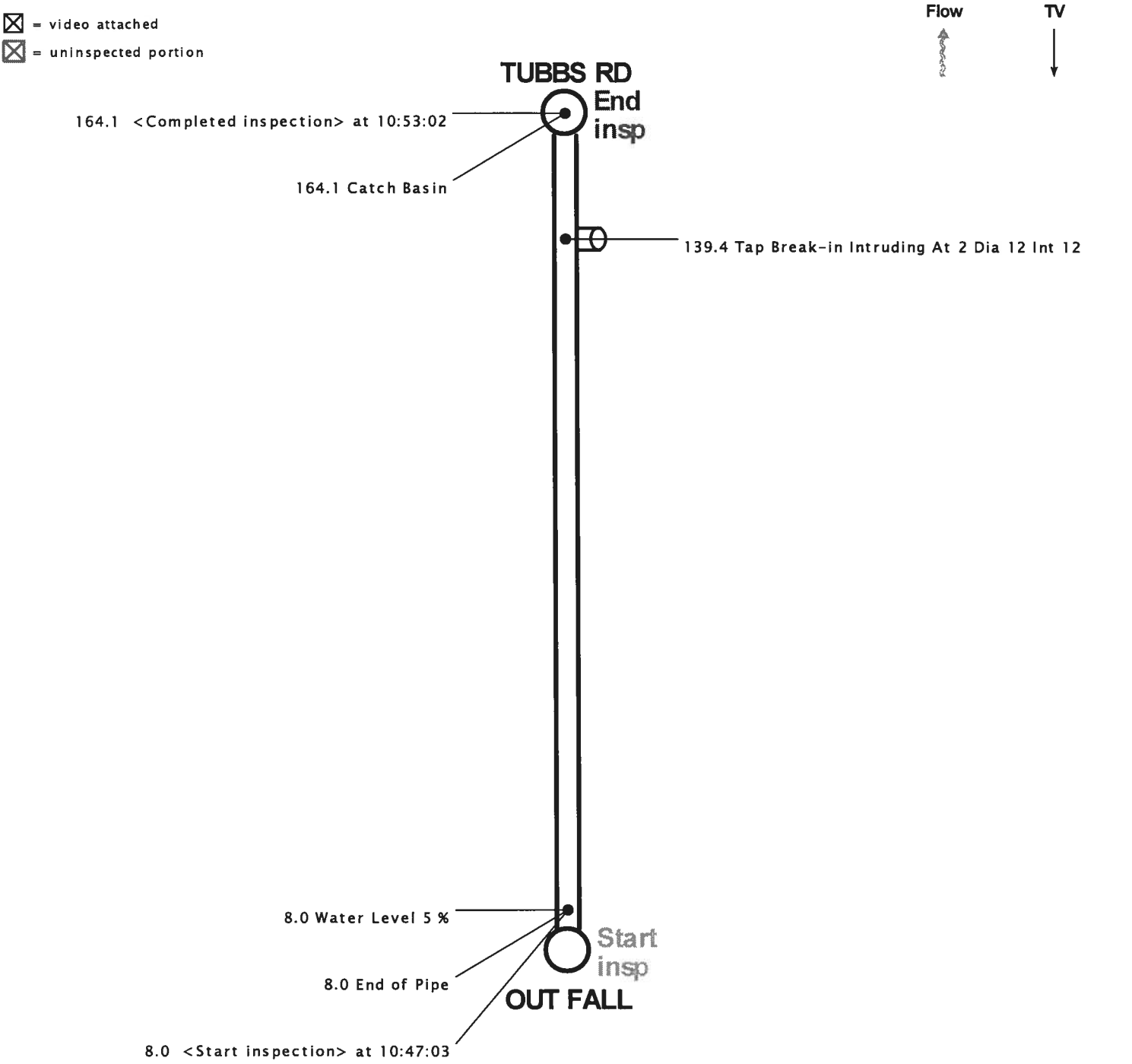
PSR	Street	City
3	KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN

Date	Time	Weather	Ht/Dia	Width	Shape	Material	Length Surveyed	Total Length	Status
08/25/2011	10:47:03	Damp	32	0	Circular	VCP	164.1	0.0	Completed

Video Name	Additional Info	Purpose	Sheet
3_8_25_2011.mpg	☒		1

☒ = video attached

☒ = uninspected portion



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Plan View Report

MH TUBBS RD to OUT FALL

Downstream Inspection

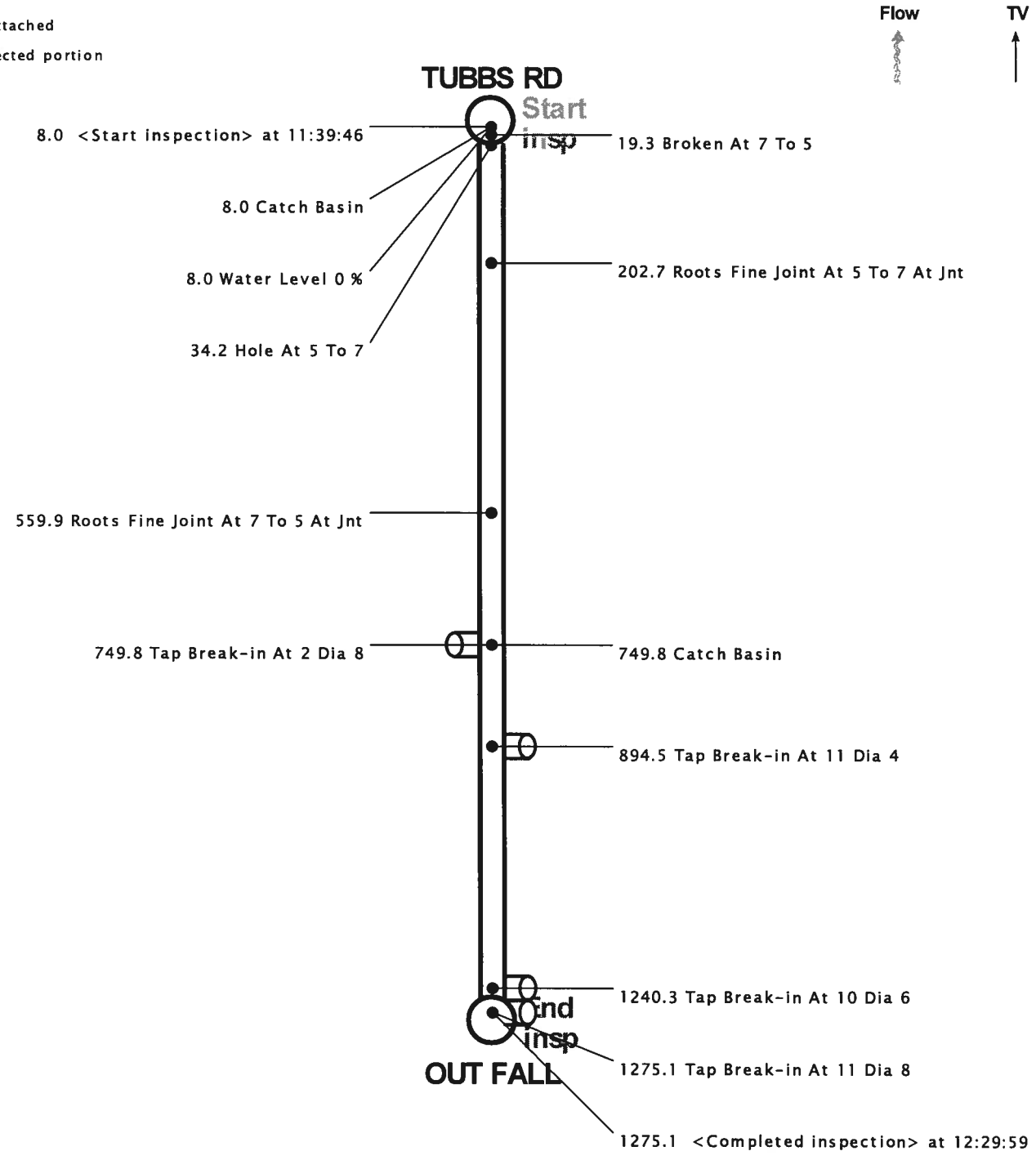
PSR	Street	City
4	KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN

Date	Time	Weather	Ht/Dia	Width	Shape	Material	Length Surveyed	Total Length	Status
08/25/2011	11:39:46	Damp	32	0	Circular	RCP	1286.9	0.0	Completed

Video Name	Additional Info	Purpose	Sheet
4_8_25_2011.mpg	☒		1

☒ = video attached

☒ = uninspected portion



CIMS v9
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Plan View Report

MH ACCESS to TUBBS RD

Upstream Inspection

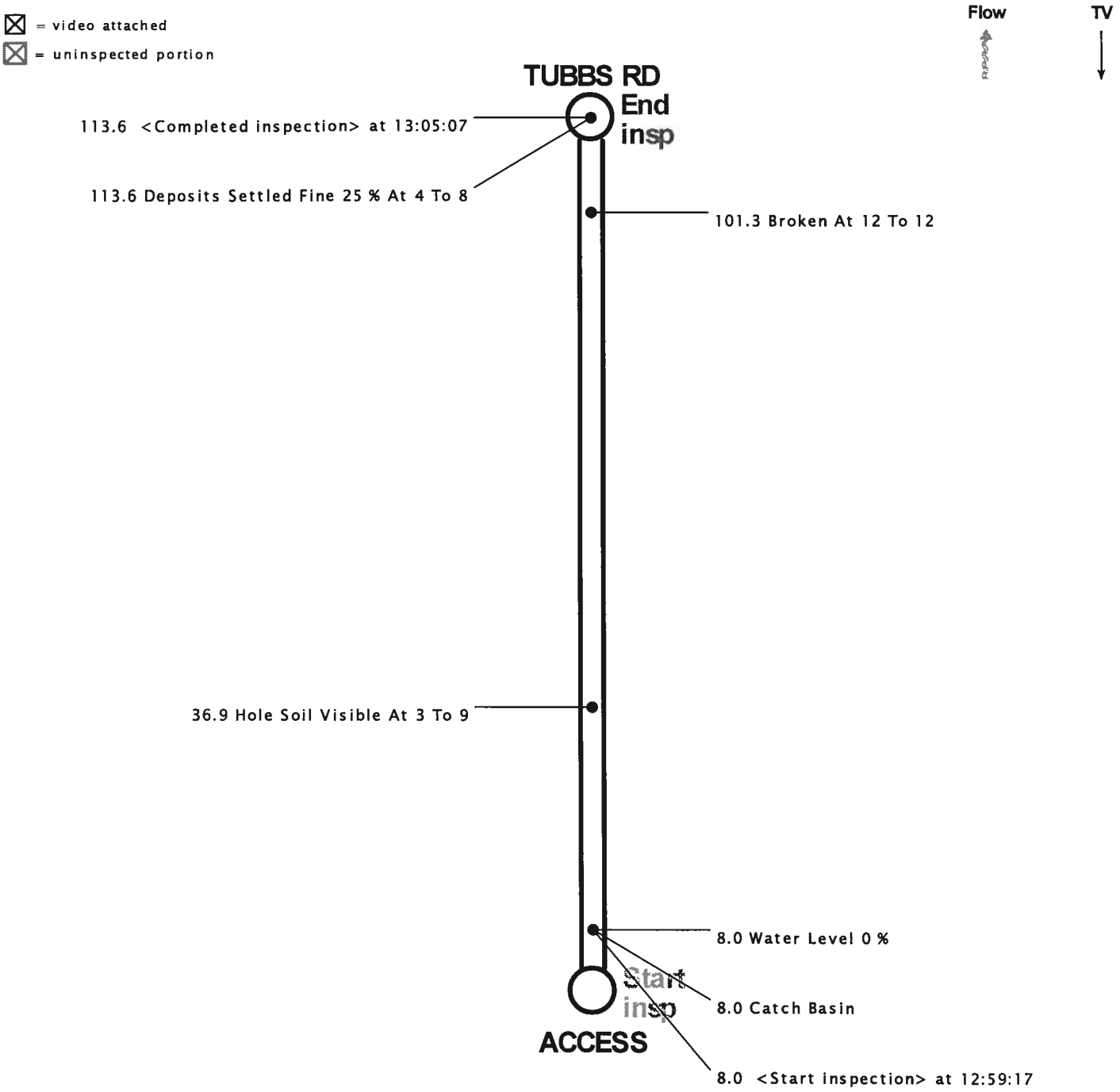
PSR	Street	City
5	KEMMER ST[MCGUINEAS DRAIN]	MANISTEE COUNTY DRAIN

Date	Time	Weather	Ht/Dia	Width	Shape	Material	Length Surveyed	Total Length	Status
08/25/2011	12:59:17	Damp	32	0	Circular	RCP	113.6	0.0	Completed

Video Name	Additional Info	Purpose	Sheet
5_8_25_2011.mpg	☒		1

☒ = video attached

☒ = uninspected portion



CIMS v9
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Pipe Length Totals Report

Project: McGuineas Drain 8.25.11

PSR	Date	UMH	DMH	Dir	Street	Material	Ht/Dia	Length	Surveyed	Status
1	08/25/2011	INLET	ACCESS 1	U	KEMMER ST[MCGUINEAS DRAIN	RCP	32	NR	73.7	Completed
2	08/25/2011	ACCESS 1	BROWN RD	D	KEMMER ST[MCGUINEAS DRAIN	RCP	32	NR	770.5	Completed
3	08/25/2011	TUBBS RD	OUT FALL	U	KEMMER ST[MCGUINEAS DRAIN	VCP	32	NR	164.1	Completed
4	08/25/2011	TUBBS RD	OUT FALL	D	KEMMER ST[MCGUINEAS DRAIN	RCP	32	NR	1286.9	Completed
5	08/25/2011	TUBBS RD	ACCESS	U	KEMMER ST[MCGUINEAS DRAIN	RCP	32	NR	113.6	Completed

	Ht/Dia	# Lines	Total Length	Length Surveyed
Summary	32	5	0.0	2408.8
Total		5	0.0	2408.8

NR = No Record / Data Not Entered
If NR is present Total Length can not be calculated.

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APPENDIX B

OPINION of PROPABLE CONSTRUCTION COSTS

Opinion of Probable Project Cost

DC Engineering
1210 N. Cedar Street, Suite B
Lansing, MI 48906

Date: 8/5/2012 Revised 9/18/2012
Client Name: Manistee County Drain Commission
Project Name: McGuineas Drain
Prepared By: Kurt Krahulik

ROUTE: Alternate 1A
WORK: Install CIPP Liner

Item No	Description	Quantity	Unit	Unit Price	Amount
1	CIPP Liner	1210	LF	$ 160	$ 193,600
2	Water (Truck & Haul water for CIPP inversion and disposal of process water)	1	LS	$ 10,000	$ 10,000
3	Manholes	2	EA	$ 3,500	$ 7,000
4	Headwall	1	EA	$ 7,000	$ 7,000
5	Mobilization (10%)		LS	10%	$ 21,760
6	Unidentified work (10%)		LS	10%	$ 21,760
	Subtotal				$ 261,120
	Contingency (10%)				$ 26,112
	SUBTOTAL (opinion of probable construction cost)				**$ 287,232**
	Engineering, Legal, & Contingency			30%	$ 86,170
	TOTAL OPINION OF PROBABLE PROJECT COST				**$ 373,402**

Opinion of Probable Project Cost

DC Engineering
1210 N. Cedar Street, Suite B
Lansing, MI 48906

Date: 8/5/2012 Revised 9/18/2012
Client Name: Manistee County Drain Commission
Project Name: McGuineas Drain
Prepared By: Kurt Krahulik

ROUTE: Alternate 1B

WORK: Construct new ditch to north County Farm Plat.
Construct new pipe to south project limits

Item No	Description	Quantity	Unit	Unit Price	Amount
1	Clearing and Grubbing	0.7	AC	$ 10,000	$ 7,000
2	Ditch Excavation	4180	CYD	$ 10	$ 41,800
3	Pipe Construction 30" (1)	915	LF	$ 88	$ 80,520
4	Pipe Construction 12"	10	LF	$ 50	$ 500
5	Manholes/Catch Basin	3	EA	$ 3,500	$ 10,500
6	Headwall	5	EA	$ 7,000	$ 35,000
7	Road Restoration	160	SY	$ 30	$ 4,800
8	Lawn/Ditch restoration	2.1	AC	$ 14,500	$ 30,450
9	Mobilization (10%)		LS	10%	$ 21,057
10	Unidentified work (10%)		LS	10%	$ 21,057
	(1) Pipe cost range from $88 for less than 10 feet deep up to $145 for 15 feet deep.				

Subtotal		$ 252,684
Contingency (10%)		$ 25,268
SUBTOTAL (opinion of probable construction cost)		**$ 277,952**
Engineering, Legal, & Contingency	30%	$ 83,386
TOTAL OPINION OF PROBABLE PROJECT COST		**$ 361,338**
OTHER		
Easement Acquisition		Undetermined

Opinion of Probable Project Cost

DC Engineering
1210 N. Cedar Street, Suite B
Lansing, MI 48906

Date: 8/5/2012 Revised 9/18/2012
Client Name: Manistee County Drain Commission
Project Name: McGuineas Drain
Prepared By: Kurt Krahulik

ROUTE: Alternate 1C

WORK: Construct new ditch to north County Farm Plat.
CIPP to south project limits.

Item No	Description	Quantity	Unit	Unit Price	Amount
1	Clearing and Grubbing	0.23	AC	$ 10,000	$ 2,300
2	Ditch Excavation	4180	CYD	$ 10	$ 41,800
3	Pipe Construction 30" (1)	70	LF	$ 88	$ 6,160
4	Manholes/Catch Basin	1	EA	$ 3,500	$ 3,500
5	CIPP Liner	845	LF	$ 160	$ 135,200
6	Headwall	5	EA	$ 7,000	$ 35,000
7	Road Restoration	53	SY	$ 30	$ 1,590
8	Lawn/Ditch restoration	0.85	AC	$ 14,500	$ 12,325
9	Mobilization (10%)		LS	10%	$ 23,788
10	Unidentified work (10%)		LS	10%	$ 23,788
	(1) Pipe cost range from $88 for less than 10 feet deep up to $145 for 15 feet deep.				

Subtotal		$ 285,450
Contingency (10%)		$ 28,545
SUBTOTAL (opinion of probable construction cost)		**$ 313,995**
Engineering, Legal, & Contingency	30%	$ 94,199
TOTAL OPINION OF PROBABLE PROJECT COST		**$ 408,194**
OTHER		
Easement Acquisition		Undetermined

Opinion of Probable Project Cost

DC Engineering
1210 N. Cedar Street, Suite B
Lansing, MI 48906

Date: 8/5/2012 Revised 9/18/2012
Client Name: Manistee County Drain Commission
Project Name: McGuineas Drain
Prepared By: Kurt Krahulik

ROUTE: Alternate 1D
WORK: Construct new pipe along entire route.

Item No	Description	Quantity	Unit	Unit Price	Amount
1	Clearing and Grubbing	0.35	Ac	$ 10,000	$ 3,500
2	Pipe Construction 30" (1)	1210	LF	$ 108	$ 130,680
3	Pipe Construction 12"	10	LF	$ 50	$ 500
4	Manholes/Catch Basin	5	EA	$ 3,500	$ 17,500
5	Headwall	1	EA	$ 7,000	$ 7,000
6	Road Restoration	160	SY	$ 30	$ 4,800
7	Lawn/Ditch restoration	1.45	AC	$ 14,500	$ 21,025
8	Protect Existing House Foundation	1	LS	$ 2,000	$ 2,000
9	Protect Existing Well	1	LS	$ 2,000	$ 2,000
10	Mobilization (10%)		LS	10%	$ 18,901
11	Unidentified work (10%)		LS	10%	$ 18,901
	(1) Pipe cost range from $88 for less than 10 feet deep up to $145 for 15 feet deep.				
	Subtotal				$ 226,806
	Contingency (10%)				$ 22,681
	SUBTOTAL (opinion of probable construction cost)				**$ 249,487**
	Engineering, Legal, & Contingency			30%	$ 74,846
	TOTAL OPINION OF PROBABLE PROJECT COST				**$ 324,333**
	OTHER				
	Temporary Easement				Undetermined

Opinion of Probable Project Cost

DC Engineering
1210 N. Cedar Street, Suite B
Lansing, MI 48906

Date: 8/5/2012 Revised 9/18/2012
Client Name: Manistee County Drain Commission
Project Name: McGuineas Drain
Prepared By: Kurt Krahulik

ROUTE: Alternate 2A

WORK: New ditch along Kemmer Road.
New pipe along south side Brown Road and along existing alignment to south project limits.

Item No	Description	Quantity	Unit	Unit Price	Amount
1	Clearing and Grubbing	0.6	AC	$ 10,000	$ 6,000
2	Ditch Excavation	8300	CYD	$ 10	$ 83,000
3	Pipe Construction 30" (1)	715	LF	$ 108	$ 77,220
4	Pipe Construction (12" grouted in 30")	50	LF	$ 75	$ 3,750
5	Pipe Construction 12"	10	LF	$ 50	$ 500
6	Service Lead (6")	150	LF	$ 30	$ 4,500
7	Manholes/Catch Basins	6	EA	$ 3,500	$ 21,000
8	Headwall	2	EA	$ 7,000	$ 14,000
9	Road Restoration	105	SY	$ 30	$ 3,150
10	Lawn/Ditch restoration	2.5	AC	$ 14,500	$ 36,250
11	Abandon Existing System	650	LF	$ 15	$ 9,750
12	Mobilization (10%)		LS	10%	$ 24,937
13	Unidentified work (10%)		LS	10%	$ 24,937
	(1) Pipe cost range from $88 for less than 10 feet deep up to $145 for 15 feet deep.				

Subtotal			$ 308,994
Contingency (10%)			$ 30,899
SUBTOTAL (opinion of probable construction cost)			**$ 339,893**
Engineering, Legal, & Contingency		30%	$ 101,968
TOTAL OPINION OF PROBABLE PROJECT COST			**$ 441,861**
OTHER			
Easement Acquisition			Undetermined

Opinion of Probable Project Cost

DC Engineering
1210 N. Cedar Street, Suite B
Lansing, MI 48906

Date: 8/5/2012 Revised 9/18/2012
Client Name: Manistee County Drain Commission
Project Name: McGuineas Drain
Prepared By: Kurt Krahulik

ROUTE: Alternate 2B

WORK: New ditch along Kemmer Road.
New pipe along south side Brown Road.
CIPP Liner existing pipe to south project limits.

Item No	Description	Quantity	Unit	Unit Price	Amount
1	Clearing and Grubbing	0.46	AC	$ 10,000	$ 4,600
2	Ditch Excavation	8300	CYD	$ 10	$ 83,000
3	Pipe Construction 30" (1)	255	LF	$ 88	$ 22,440
4	CIPP Liner	460	LF	$ 160	$ 73,600
5	Pipe Construction (12" grouted in 30")	50	LF	$ 75	$ 3,750
6	Service Lead (6")	150	LF	$ 30	$ 4,500
7	Manholes/Catch Basins	4	EA	$ 3,500	$ 14,000
8	Headwall	2	EA	$ 7,000	$ 14,000
9	Road Restoration	105	SY	$ 30	$ 3,150
10	Lawn/Ditch restoration	2	AC	$ 14,500	$ 29,000
11	Abandon Existing System	650	LF	$ 15	$ 9,750
12	Mobilization (10%)		LS	10%	$ 25,204
13	Unidentified work (10%)		LS	10%	$ 25,204
	(1) Pipe cost range from $88 for less than 10 feet deep up to $145 for 15 feet deep.				

Subtotal		$	312,198
Contingency (10%)		$	31,220
SUBTOTAL (opinion of probable construction cost)		**$**	**343,418**
Engineering, Legal, & Contingency	30%	$	103,025
TOTAL OPINION OF PROBABLE PROJECT COST		**$**	**446,443**
OTHER			
Easement Acquisition			Undetermined

Opinion of Probable Project Cost

DC Engineering
1210 N. Cedar Street, Suite B
Lansing, MI 48906

Date: 8/5/2012 Revised 9/18/2012
Client Name: Manistee County Drain Commission
Project Name: McGuineas Drain
Prepared By: Kurt Krahulik

ROUTE: Alternate 2C

WORK: Construction new pipe system along entire route

Item No	Description	Quantity	Unit	Unit Price	Amount
1	Clearing and Grubbing	0.21	AC	$ 10,000	$ 2,100
2	Pipe Construction 30" (1)	1335	LF	$ 92	$ 122,820
3	Pipe Construction (12" grouted in 30")	50	LF	$ 75	$ 3,750
4	Pipe Construction 12"	10	LF	$ 50	$ 500
5	Service Lead (6")	150	LF	$ 30	$ 4,500
6	Manholes/Catch Basins	6	EA	$ 3,500	$ 21,000
7	Headwall	2	EA	$ 7,000	$ 14,000
8	Road Restoration	1030	SY	$ 30	$ 30,900
9	Lawn Restoration	1.55	AC	$ 14,500	$ 22,475
10	Abandon Existing system	650	LF	$ 15	$ 9,750
11	Mobilization (10%)		LS	10%	$ 22,205
12	Unidentified work (10%)		LS	10%	$ 22,205
	(1) Pipe cost range from $88 for less than 10 feet deep up to $145 for 15 feet deep.				
				Subtotal	$ 276,204
				Contingency (10%)	$ 27,620
				SUBTOTAL (opinion of probable construction cost)	**$ 303,824**
				Engineering, Legal, & Contingency 30%	$ 91,147
				TOTAL OPINION OF PROBABLE PROJECT COST	**$ 394,971**
				OTHER	
				Temporary Easement	Undetermined

Opinion of Probable Project Cost

DC Engineering
1210 N. Cedar Street, Suite B
Lansing, MI 48906

Date: 8/5/2012 Revised 9/18/2012
Client Name: Manistee County Drain Commission
Project Name: McGuineas Drain
Prepared By: Kurt Krahulik

ROUTE: Alternate 3A

WORK: New ditch construction along Kemmer and Tubbs.
New storm sewer along existing alignment to south project limits.

Item No	Description	Quantity	Unit	Unit Price	Amount
1	Clearing and Grubbing	1.1	AC	$ 10,000	$ 11,000
2	Ditch Excavation	12950	CYD	$ 10	$ 129,500
3	Pipe Construction 30" (1)	230	LF	$ 88	$ 20,240
4	Pipe Construction (12" grouted in 30")	50	LF	$ 75	$ 3,750
5	Service Lead (6")	150	LF	$ 30	$ 4,500
6	Manholes/Catch Basins	3	EA	$ 3,500	$ 10,500
7	Headwall	4	EA	$ 7,000	$ 28,000
8	Road Restoration	160	SY	$ 30	$ 4,800
9	Lawn/Ditch restoration	3.2	SY	$ 14,500	$ 46,400
10	Abandon Existing System	1020	LF	$ 15	$ 15,300
11	Mobilization (10%)		LS	10%	$ 25,869
12	Unidentified work (10%)		LS	10%	$ 25,869
	(1) Pipe cost range from $88 for less than 10 feet deep up to $145 for 15 feet deep.				
				Subtotal	$ 325,728
				Contingency (10%)	$ 32,573
				SUBTOTAL (opinion of probable construction cost)	**$ 358,301**
				Engineering, Legal, & Contingency 30%	$ 107,490
				TOTAL OPINION OF PROBABLE PROJECT COST	**$ 465,791**
				OTHER	
				Easement Acquisition	Undetermined

Opinion of Probable Project Cost

DC Engineering
1210 N. Cedar Street, Suite B
Lansing, MI 48906

Date: 8/5/2012 Revised 9/18/2012
Client Name: Manistee County Drain Commission
Project Name: McGuineas Drain
Prepared By: Kurt Krahulik

ROUTE: Alternate 3B

WORK: Construct new storm sewer along entire route.

Item No	Description	Quantity	Unit	Unit Price	Amount
1	Clearing and Grubbing	0.34	AC	$ 10,000	$ 3,400
2	Pipe Construction 30" (1)	1410	LF	$ 108	$ 152,280
3	Pipe Construction (12" grouted in 30")	50	LF	$ 75	$ 3,750
4	Pipe Construction 12"	10	LF	$ 50	$ 500
5	Service Lead (6")	150	LF	$ 30	$ 4,500
6	Manholes/Catch Basins	6	EA	$ 3,500	$ 21,000
7	Headwall	2	EA	$ 7,000	$ 14,000
8	Road Restoration	1425	SY	$ 30	$ 42,750
9	Lawn restoration	0.7	AC	$ 14,500	$ 10,150
10	Abandon Existing system	1020	LF	$ 15	$ 15,300
					$ -
11	Mobilization (10%)		LS	10%	$ 25,233
12	Unidentified work (10%)		LS	10%	$ 25,233
	(1) Pipe cost range from $88 for less than 10 feet deep up to $145 for 15 feet deep.				
	Subtotal				$ 318,096
	Contingency (10%)				$ 31,810
	SUBTOTAL (opinion of probable construction cost)				**$ 349,906**
	Engineering, Legal, & Contingency			30%	$ 104,972
	TOTAL OPINION OF PROBABLE PROJECT COST				**$ 454,878**

Opinion of Probable Project Cost

DC Engineering
1210 N. Cedar Street, Suite B
Lansing, MI 48906

Date: 8/5/2012 Revised 9/18/2012
Client Name: Manistee County Drain Commission
Project Name: McGuineas Drain
Prepared By: Kurt Krahulik

ROUTE: Alternate 4A

WORK: Construct new open ditch from McGuineas Drain south across US31 to the Manistee River

Item No	Description	Quantity	Unit	Unit Price	Amount
	Clearing and Grubbing	5.5	AC	$ 10,000	$ 55,000
	Ditch Excavation	62000	CYD	$ 10	$ 620,000
	Pipe Construction under US31 (72" Jack&Bored)	150	LF	$ 1,750	$ 262,500
	Headwall	2	EA	$ 20,000	$ 40,000
	Outfall at Manistee River	1	LS	$ 200,000	$ 200,000
	Lawn/Ditch restoration	5	AC	$ 14,500	$ 72,500
	Mobilization (10%)		LS	10%	$ 125,000
	Unidentified work (10%)		LS	10%	$ 125,000
				Subtotal	$ 1,500,000
				Contingency (10%)	$ 150,000
				SUBTOTAL (opinion of probable construction cost)	**$ 1,650,000**
				Engineering, Legal, & Contingency 30%	$ 495,000
				TOTAL OPINION OF PROBABLE PROJECT COST	**$ 2,145,000**
				OTHER	
				Easement Acquisition	Undetermined
				Wetland Mitigation	Undetermined