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Executive Summary

The Oakland-Macomb Interceptor Drain (OMID) is a portion of an existing sanitary sewer system that was built in the early 1970s by Detroit Water & Sewerage Department (DWSD). This system is broken up into three major interceptors: Edison Corridor, Oakland Arm and Avon Arm. This entire system is the sole conveyance conduit for transport of sanitary sewage to DWSD wastewater treatment facility for over 830,000 people in Macomb and Oakland County communities. These interceptors accept sanitary flows generated from communities that are either part of the Clinton Oakland Sewage Disposal District (C-OSDS) in Oakland County or the Macomb County Wastewater Disposal District (MCWDD) in Macomb County.

The Clinton-Oakland Sewage Disposal District (C-OSDS) covers a large section of northern Oakland County and this district is operated by the office of the Oakland County Water Resources Commissioner (OCWRC). It serves all or parts of the following communities:

- City of Auburn Hills
- City of Clarkston
- City of Rochester
- City of Rochester Hills
- City of Lake Angelus
- Village of Lake Orion
- Village of Oxford
- Independence Township
- Oakland Township
- Orion Township
- Oxford Township
- West Bloomfield Township
- Waterford Township

The Macomb County Wastewater Disposal District (MCWDD) encompasses the central part of Macomb County, and is operated by the Macomb County Public Works Commissioner's Office. The service area currently includes all or parts of the following communities:

- City of Fraser
- City of Sterling Heights
- City of Utica
- Macomb Township
- Chesterfield Township
- Clinton Township
- Harrison Township
- Shelby Township
- Washington Township
- Lenox Township
- Village of New Haven

The OMID was constructed in 1970 and 1971 along with the Romeo Arm which, over the past 38 years, has experienced a number of near catastrophic failures. Collapse of portions of the Romeo Arm interceptor have disrupted service to much of the eastern portion of Macomb County and caused sanitary sewer overflow to the surrounding area.

Because of these failures a recent in-depth inspections of the interceptor was completed and identified a number of areas of major deterioration. These inspections indicate numerous areas where significant infiltration is occurring continuously. These are often accompanied by identifiable indications of voids adjacent to the pipe where surrounding soil has been washed into the interceptor. The inspection has also identified areas where serious structural deficiencies in the pipe wall are evident. **It is the intent of this project to perform extensive rehabilitation of the OMID to return the facilities to a condition commensurate with a minimum 20-year life span.**

Failure of this conduit could result in the total loss of sanitary sewage capacity for over 830,000 people in Oakland and Macomb Counties and prevent flow from being transported to DWSD for treatment. Within hours of even a partial blockage tributary communities would no longer be able to discharge flow to the interceptor. To prevent the possibility of massive system backup – into basements –untreated sanitary flows would have be diverted to drains and streams tributary to the Clinton River and Lake St. Clair.

Three alternatives were evaluated: No Action – which would leave the system vulnerable to failure; Replacement – which would be extremely expensive, and disruptive to the communities within which it would be located; and, Rehabilitation – which is the selected alternative.

The Rehabilitation Alternative consists of a series of coordinated efforts that are intended to allow the existing OMID conduit to be physically rehabilitated to assure optimal performance, hydraulic capacity, and structural stability such that the entire facility maintains a useful life of at least 20 years.

Rehabilitation efforts are closely tied to the findings of the evaluation performed. The effort requires considerable labor inside the OMID tunnel which continually transports sanitary sewage from suburban communities to DWSD for treatment. To effectively undertake the needed rehabilitation flow must be controlled within the system. To allow for systematic retention of flow – allowing workers to enter the tunnel – a series of flow control gates are planned to be constructed. The gates will prevent – or restrict – flows from moving downstream. This will utilize upstream pipe capacity as storage and provide for work to be completed 'in the dry' within downstream segments. Since the capacity of the tunnel is limited the holding time available within the system will similarly be limited to only a few hours at a time. Construction methods selected will allow for use of methods and materials able to be installed in segments over time and that can be immersed under water within hours of installation.

Rehabilitation efforts are expected to be completed over a five year time frame, beginning in 2009 concluding in late 2013.

The total project capitol cost is expected to be $144,601,347. These costs are expected to be covered by State Revolving Fund Loans and Bonds to be paid off over a 20 year period. Including an allowance for required Operation & Maintenance costs, the annual cost per customer for this additional expenditure is projected to be $31.68.

Average annual costs per customer in Macomb County will rise from $208.59 to $240.27. Average annual cost per customer in Oakland County will rise from $182.16 to $213.84.

Direct impacts of this project include potential short-term impacts due to increased noise and dust during construction and possible traffic disruptions during material transporting. Minor disturbances to recreational park areas are also anticipated. Long-term environmental impacts are strictly positive in that the project will eliminate the potential discharge of raw sewage into basements and local waterways. All disturbed areas will be returned to original state or better.

1.0 Project Background

1.1 STUDY AREA CHARACTERISTICS

1.1.1 Delineation of the Study Area

The study area used to prepare this project plan includes all communities within Oakland and Macomb Counties whose sanitary flow is tributary to the Oakland-Macomb Interceptor Drain. The Oakland-Macomb Interceptor Drain (OMID) conveys sanitary sewage from large portions of Oakland and Macomb Counties to Detroit for eventual treatment at the Detroit Water and Sewerage Department (DWSD) wastewater treatment facility. Sanitary flows are generated from communities that are either part of the Clinton Oakland Sewage Disposal District (C-OSDS) in Oakland County or the Macomb County Wastewater Disposal District (MCWDD) in Macomb County.

The Clinton-Oakland Sewage Disposal District (C-OSDS) covers a large section of northern Oakland County. The district is operated by the office of the Oakland County Water Resources Commissioner (OCWRC). It serves all or parts of the following communities:

- City of Auburn Hills
- City of Clarkston
- City of Rochester
- City of Rochester Hills
- City of Lake Angelus
- Village of Lake Orion
- Village of Oxford
- Independence Township
- Oakland Township
- Orion Township
- Oxford Township
- West Bloomfield Township
- Waterford Township

No communities beyond those currently served by OCWRC have been included as potential future customers nor provided for under this Project Plan.

The Macomb County Wastewater Disposal District (MCWDD) encompasses the central part of Macomb County, and is operated by the Macomb County Public Works Commissioner's Pffoce. The service area currently includes all or parts of the following communities:

- City of Fraser
- City of Sterling Heights
- City of Utica
- Macomb Township
- Chesterfield Township
- Clinton Township
- Harrison Township
- Shelby Township
- Washington Township
- Lenox Township
- Village of New Haven

The following communities are located within the Macomb County service district but are not currently connected to the interceptor system. These communities do not have agreements with the MCWWD for service. They will be considered within this Project Plan as potential future customer communities. The proposed facilities will not be increased in capacity under this effort to handle their future sanitary flows.

- Ray Township
- Armada Township
- Bruce Township
- Richmond Township

A Chapter 21 [Inter-County] Drain Called the Oakland-Macomb Interceptor Drain Drainage District (OMIDDD) will be formed to take over ownership and operation of the OMID from DWSD. The district will encompass all communities in Oakland and Macomb Counties within the OMID service district. Figure 1 presents a map showing Macomb and Oakland Counties and the OMIDDD boundary.

The OMID was originally built by DWSD as one of a group of interceptor sewers designed to serve communities in central Macomb and northern Oakland Counties. These interceptors were put into service in 1971. The original DWSD interceptors include the Lakeshore Interceptor, the Garfield/Romeo Arm Interceptor, the 15 Mile Road Interceptor, the Oakland Arm Interceptor, the Avon Arm Interceptor and the Edison Corridor Interceptor.

Only the Oakland Arm, Avon Arm and Edison Corridor Interceptors – which convey flow from both Oakland and Macomb Counties – will be owned and operated by the OMIDDD.

The operation of the C-OSDS will remain the responsibility of the OCWRC. C-OSDS flows enter the OMID thru existing metering facilities at Dequindre Road near Avon Road and Dequindre Road near South Boulevard.

The Lakeshore, Garfield/Romeo Arm and 15 Mile Road Interceptors will become the responsibility of the MCWDD.

Figure 2 presents a map showing the location of component portions of the interceptor system that will be owned/operated by the Oakland-Macomb Interceptor Drain Drainage District (OMIDDD). The facilities described throughout the remainder of this Project Plan and the improvements identified are only associated with the Oakland-Macomb Interceptor Drain.

1.1.2 Land Use in the Study Area

The land use within the study area is primarily suburban in nature. Communities within the much of the study area have seen the majority of their growth in past decades and are currently experiencing redevelopment as opposed to expansion. The exception to this trend are some communities in Macomb County where – prior to the recent economic downturn – were experiencing significant new residential and commercial development. Outlying communities in Macomb County which are part of the MCWDD but are not presently served by the system are largely rural in nature and are expected to remain so through most – if not all – of the project planning period.

Table 1-1 summarizes the land use within the study area as reported by the Southeast Michigan Council of Governments (SEMCOG). Statistics are broken down by C-OSDS communities, MCWDD served communities, and MCWDD future communities. A detailed community by community land use breakdown is included in Appendix A-Section 1.

Table 1-1: Land Use Estimates Year 2000 (SEMCOG Community Profiles, March 2009)

	C-OSDS Connected		MCWDD Connected		MCWDD Future	
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Residential	**68,741**	**40.59%**	**60,290**	**36.19%**	**13,228**	**14.18%**
Single-Family	*64,663*	*38.18%*	*55,620*	*33.39%*	*13,218*	*14.16%*
Multiple-Family	*4,077*	*2.41%*	*4,672*	*2.80%*	*10*	*0.01%*
Non-Residential	**23,557**	**13.91%**	**30,000**	**18.01%**	**5,534**	**5.93%**
Commercial and Office	*5,100*	*3.01%*	*6,423*	*3.86%*	*159*	*0.17%*
Industrial	*4,560*	*2.69%*	*6,587*	*3.95%*	*3,585*	*3.84%*
Institutional	*4,220*	*2.49%*	*3,622*	*2.17%*	*172*	*0.18%*
Trans., Utility Comm.	*2,586*	*1.53%*	*5,511*	*3.31%*	*569*	*0.61%*
Cultur., Outdoor Rec., Cem.	*7,091*	*4.19%*	*7,856*	*4.72%*	*1,044*	*1.12%*
Under Development	**4,485**	**2.65%**	**5,349**	**3.21%**	**549**	**0.59%**
Active Agriculture	**10,849**	**6.41%**	**29,900**	**17.95%**	**55,662**	**59.65%**
Grassland and Shrub	**19,653**	**11.60%**	**23,565**	**14.15%**	**6,615**	**7.09%**
Woodland and Wetland	**28,155**	**16.62%**	**14,628**	**8.78%**	**11,392**	**12.21%**
Extractive and Barren	**3,575**	**2.11%**	**542**	**0.33%**	**125**	**0.13%**
Water	**10,339**	**6.10%**	**2,310**	**1.39%**	**207**	**0.22%**
Total Acres	**169,358**	**100.00%**	**166,584**	**100.00%**	**93,315**	**100.00%**

1.1.3 Surface and Ground Waters

The vast majority of the study area coincides with the Clinton River Watershed. Portions of Chesterfield, Lenox, and Harrison Townships are tributary to small streams or County Drains discharging to Anchor Bay of Lake St. Clair. Portions of Richmond, Richmond Township as well as Memphis and Romeo are within the Belle River Watershed. Figure 3 shows the Clinton and Belle River Watersheds, the Anchor Bay Watershed as well as the communities that make up the OMID study area.

Water quality within these streams is consistent with urban area rivers throughout the state. The Clinton River is primarily adversely affected by urban runoff during wet weather conditions. The OMID does not transport combined sewage flow; and there are no identified instances of wet weather related sanitary sewer overflows to receiving waters from this facility.

If OMID has a catastrophic failure water supply for industrial, agricultural and drinking water could be affected. According the MDEQ Water Withdrawal Reports, Data and Graphics website (www.michigan.gov/deq/0,1607,7-135-3313_3677_3704-72931--,00.html, March 2009) Macomb County and Oakland County contain water withdrawals, respectively, from 3 and 25 industrial facilities, 18 and 7 agricultural farms, and 12 and 79 public drinking water systems served from the Great Lakes and ground water.

1.2 ECONOMIC CHARACTERISTICS

1.2.1 Employment

Employment within the study area as well as throughout Southeast Michigan is highly dependent on the automotive industry and allied manufacturing enterprises. The recent economic downturn – especially as it has impacted automotive production – has reduced the number of manufacturing jobs within the area. Oakland and Macomb Counties are actively encouraging the growth of alternative industries to replace jobs lost from automotive manufacturing. Alternative energy – solar and battery – production facilities are proposed for the area. And a former General Motors truck production plant within the area is slated to be converted to a motion picture studio complex.

According to recent SEMCOG reports' Manufacturing comprises about 15% of employment in the area – still representing the largest employment sector, and Retail Trade is about 14%. Leisure & Hospitality and Health Care & Social Assistance each account for about 10% of area employment. Education Services and Professional, Scientific and Technical Services each represent slightly less than 9% of the area employment.

Table 1-2 presents a summary of employment for the area based on SEMCOG's estimates. A detailed community by community employment breakdown is included in Appendix A – Section 2.

Table 1-2: Employment Statistics Year 2005 (SEMCOG Community Profiles, March 2009)

	C-OSDS Connected		**MCWDD Connected**		**MCWDD Future**	
	Workers	***Percent***	***Workers***	***Percent***	***Workers***	***Percent***
Natural Resources & Mining	17	0.01%	231	0.15%	-	0.00%
Manufacturing	21,667	14.64%	21,333	14.24%	532	20.89%
Wholesale Trade	5,422	3.66%	5,328	3.56%	84	3.30%
Retail Trade	18,382	12.42%	24,311	16.23%	152	5.97%
Transportation & Warehousing	2,288	1.55%	2,021	1.35%	258	10.13%

	C-OSDS Connected		MCWDD Connected		MCWDD Future	
	Workers	*Percent*	*Workers*	*Percent*	*Workers*	*Percent*
Information	903	0.61%	627	0.42%	-	0.00%
Financial Activities	7,755	5.24%	5,717	3.82%	11	0.43%
Prof, Scientific, & Tech	19,026	12.86%	7,566	5.05%	5	0.20%
Management of Companies	5,688	3.84%	61	0.04%	-	0.00%
Administrative, Support	11,890	8.03%	10,085	6.73%	-	0.00%
Education Services	13,577	9.17%	13,049	8.71%	264	10.37%
Health Care & Social Assist	15,781	10.66%	13,205	8.82%	163	6.40%
Leisure & Hospitality	16,012	10.82%	15,433	10.30%	15	0.59%
Other Services	3,739	2.53%	5,279	3.52%	37	1.45%
Public Administration	2,978	2.01%	1,991	1.33%	-	0.00%
Total	**147,989**	**100.00%**	**149,790**	**100.00%**	**2,547**	**100.00%**

1.2.2 Household Income

Household income throughout Southeast Michigan and the study are based on SEMCOG 1999 data. This is not necessarily representative on 2009 information; however, it is the most up-to-date information available.

Table 1-3 presents a summary of the average income for the area based on SEMCOG's estimates. A detailed community by community average income breakdown is included in Appendix A –Section 3.

Table 1-3: Average Income Year 1999 (SEMCOG Community Profiles, March 2009)

	C-OSDS Connected	MCWDD Connected	MCWDD Future
Average Median Income	$67,556	$56,354	$68,547
Average Per Capita Income	$32,597	$24,875	$26,193

1.2.3 Economic Characteristics

As noted above, the recent economic downturn – especially as it has impacted automotive production – has reduced the number of manufacturing jobs within the area. Oakland and Macomb Counties are actively encouraging the growth of alternative industries to replace jobs lost from automotive manufacturing. Even though the current trend for employment is sliding downward, if the rehabilitation of OMID does not occur incoming potential employers would choose to locate elsewhere do to potential sewage removal/treatment failure.

1.3 EXISTING FACILITIES

The Oakland-Macomb Interceptor Drain (OMID) consists of a portion of the interceptor system built in the early 1970s by DWSD to serve Macomb and Oakland County communities. These DWSD facilities are known as the Edison Corridor, Oakland Arm and Avon Arm Interceptors. The construction was completed under a number of separate contracts designated by "Pollution Control Interceptor" or PCI numbers. Figure 4 shows the route of these interceptors as well as the limits of each PCI contract under which construction was completed.

The OMID is a conveyance facility transporting sanitary flow to DWSD for treatment. Within the OMID there are no major industrial dischargers, sludge handling and treatment facilities, or pump station. There are no combined sewers or tributary combined sewers connected to or within OMID, nor are there any sanitary sewer overflow bypass structures. No high flow related sanitary discharges have been associated with the OMID. However, sanitary discharges have occurred in adjacent portions of the Romeo Arm Interceptor, along Fifteen Mile Road, when catastrophic pipe failure caused total collapse of the interceptor pipe. There are no problems associated with routine operation or maintenance of the OMID.

It should be noted that even though no sanitary sewer overflows have been associated with this area, the presence of infiltration and the need for major rehabilitation of large portions of the OMID has been documented through detailed investigations performed by NTH Consultants, Ltd. in 2007 and 2008. These severe structural deficiencies together with major infiltration problems form the basis for the Need for the Project which will be presented in Section 1-4 of this Project Plan.

The OMIDDD has been formed to take over ownership and operation of the OMID from DWSD. OMIDDD will have no jurisdiction over any treatment plants, sludge management facilities, industrial pre-treatment facilities, or pumping stations. However, there will be septage receiving facilities within the Clinton-Oakland District and service area of the OMIDDD. Municipal wastewater collection facilities are owned and operated by the individual Cities, Villages and Townships listed in Section 1.1.1. These communities are customers of either the C-OSDS or the MCWDD. Sludge resulting from the treatment process is the responsibility of the DWSD. Figure 2 shows the location of the sewage transport sewers operated by OMIDDD.

1.3.1 Oakland-Macomb Interceptor Drain Segments

The Edison Corridor Interceptor is the most downstream portion of the system connecting to the DWSD Northeast Wastewater Pumping Station (NEPS). This pumping station is located south of Eight Mile Road and west of Hoover Road in the City of Detroit.

Contract PCI-5 began at the NEPS and continued north within an easement from Eight Mile Road northerly to just north of Ten Mile Road. This segment of the interceptor was constructed in a tunnel with an inside diameter of 12 feet 9 inches. Tunnel depth varies between 97 and 110 feet below grade. The tunnel is constructed of steel ribs and wooden lagging with an un-reinforced cast-in-place concrete liner.

The next upstream segment is PCI-6 which begins at Ten Mile Road and continues northerly to Common Road. This segment of the interceptor was constructed in a tunnel with an inside diameter of 12 feet 9 inches. Tunnel depth varies between 80 and 97 feet below grade. The tunnel is constructed of steel ribs and wooden lagging with an un-reinforced cast-in-place concrete liner.

The final segment of the Corridor Interceptor was constructed under contract PCI-7. This segment begins at Common Road and continues northerly to Fifteen Mile Road. It is noteworthy that the interceptor within this segment crosses under the Red Run Drain branch of the Clinton River – between Fourteen and Fifteen Mile Roads. This segment of the interceptor was constructed in a tunnel with an inside diameter of 12 feet 9 inches. Tunnel depth varies between 63 and 80 feet below grade. The tunnel is constructed of steel ribs and wooden lagging with an un-reinforced cast-in-place concrete liner.

At Fifteen Mile Road the DWSD interceptor system branched to the east and to the northwest. The interceptors built east of the Corridor Interceptor serve only Macomb County communities and are tributary to – but not part of – the OMID for which this Project Plan has been developed.

The Oakland Arm Interceptor was constructed northwesterly from Fifteen Mile Road under DWSD contracts PCI-8, PCI-9, PCI-10A and PCI-10B.

Contract PCI-8 tees off the north end of PCI-7 at the Edison Corridor and follows Fifteen Mile Road westerly to Dodge Park Road. At this point the interceptor turns sharply and continues northerly to Utica Road. This segment of the interceptor was constructed in a tunnel with an inside diameter of 9 feet 6 inches. Tunnel depth varies between 40 and 62 feet below grade. The tunnel is constructed of steel ribs and wooden lagging with an un-reinforced cast-in-place concrete liner.

The next upstream segment is PCI-9 which continues along Utica Road to north of M-59 where it follows Koth Lane northwesterly to an easement adjacent to the Conrail right-of-way. It remains within this easement into River Bends Park (Shelby Township). This segment of the interceptor was constructed in a tunnel with an inside diameter of 8 feet 9 inches. Tunnel depth varies between 24 and 40 feet below grade. The tunnel is constructed of steel ribs and wooden lagging with an un-reinforced cast-in-place concrete liner.

PCI-10A – upstream of PCI-9 – was also constructed within River Bends Park. This segment was constructed using open cut techniques to install 8 foot diameter reinforced concrete pipe. Pipe invert elevations range between 24 and 26 feet below grade within this segment.

PCI-10B is the final – most northerly – segment of the Oakland Interceptor. This segment begins within River Bends Park and follows Dequindre Road to a point south of Avon Road. At this location the interceptor ends at a structure housing Sewage Meter OC-S-2. Flow from Oakland County's Clinton-Oakland Interceptor is tributary to the Oakland Arm Interceptor at this point.

PCI-10B was constructed using both tunnel and open cut methods. The entire segment is 8 feet in diameter, with the open cut portion using reinforced concrete pipe and the tunneled portion constructed of steel ribs and wooden lagging with an un-reinforced cast-in-place concrete liner. Pipe invert elevations range between 26 and 34 feet below grade within this segment.

The Avon Arm branches off of the Oakland Arm at M-59 and Utica Road. It follows M-59 westerly to Dequindre Road. At this location the interceptor ends at a structure housing Sewage Meter RC-S-1. Flow from Oakland County's Gibson Avon Arm Interceptor is tributary to the Oakland Arm Interceptor at this point. The Avon Arm interceptor was constructed under DWSD contract PCI-11A as well as under a contract let by The State of Michigan Highway Department for sewer realignment due to M-59 reconstruction during the 1990s. About 2,800 feet of the current pipe was constructed under PCI-11A and about 11,200 feet by the State. The pipe in this arm of the interceptor ranges from 3 feet to 4 feet in diameter. Best available information indicates both open-cut and pipe-jacking construction methods were employed within this segment. Pipe invert elevations range between 20 and 29 feet below grade within this segment.

Table 1-4 presents the design capacity of each OMID segment [by PCI number] and the most recent average flow values.

Table 1-4: Calculated Design Capacity/Current Flows OMID Segments

	Diameter (ft)	Limiting Grade	Max "Q" Full Flow	Current Flows Average
PCI-5	12.75	0.068%	900 cfs	117.5 cfs
PCI-6	12.75	0.068%	900 cfs	117.5 cfs
PCI-7	12.75	0.068%	900 cfs	117.5 cfs
PCI-8	9.50	0.117%	400 cs	67.1 cfs
PCI-9	8.75	0.160%	150 cfs	50.0 cfs
PCI-10A	8.00	0.220%	175 cfs	44.7 cfs
PCI-10B	8.00	0.220%	175 cfs	44.7 cfs
PCI-11A	4.00	0.060%	40 cfs	4.1 cfs
PCI-11A	3.50	0.120%	38 cfs	3.1 cfs
PCI-11A	3.00	0.100%	23 cfs	3.1 cfs

(Manning's Equation n=0.013)

1.4 NEED FOR THE PROJECT

The OMID is the sole conveyance conduit for the transport of sanitary sewage for over 830,000 people in Southeast Michigan. It was constructed in 1970 and 1971 along with the Romeo Arm which over the 38 years since its construction has experienced a number of near catastrophic failures. Collapse of portions of the Romeo Arm interceptor have disrupted service to much of the eastern portion of Macomb County and caused sanitary sewer overflow to the surrounding area.

While the Romeo Arm is a separate pipe from the OMI it is directly connected to the OMI and can be considered part of the same overall sewage transport system as the OMI. The OMI and the Romeo Arm/15 Mile Road Interceptor were constructed in the same time period, using the same design and materials, within the same soil conditions and by the same contactors. Problems experienced in one can reasonably be expected to occur in the other.

NTH conducted inspections in both parts of the system and DWSD/Macomb County are addressing the structural deficiencies in the Romeo Arm/15 Mile Interceptor at the present time. The proposed rehabilitation of the OMI is to proactively address the structural issues observed to prevent the types of failure that have taken place along 15 Mile Road. When failure in the 15 Mile Road Interceptor occurred in 2004 a large sinkhole engulfed much of the 14 Mile Road pavement and came dangerously close to destroying a number of homes – which were eventually protected by sheet pile restraints. Should a similar sink hole develop along the Corridor Interceptor the size would likely be larger – since the sewer is significantly deeper – and the toppling of one or more ITC transmission towers would be inevitable.

Additionally, up to 83 million gallons of sanitary sewage flows through the lower portions of the OMI every day. Unrepaired structural degradation leading to the types of collapse seen on the adjacent interceptor would require these flows to be bypassed into the Clinton River until – at minimum – a bypass pumping system could be put in place. Constructing this type of pump-around could take up to a week depending on upstream flow volumes and the depth of the collapsed sewer.

Recent in-depth inspections of the interceptor have identified a number of areas of major deterioration. These inspections indicate numerous identified areas where significant infiltration is occurring continuously. These are often accompanied by identifiable indications of voids adjacent to the pipe where surrounding soil has been washed into the interceptor. The inspection has also identified areas where serious structural deficiencies in the pipe wall are evident. **It is the intent of the OMIDDD to perform extensive rehabilitation of the OMID to return the facilities to a condition commensurate with a minimum 20-year life span.** Section 1.4.5, below, summarizes the findings of the NTH inspection report – which provides in-depth descriptions of identified problem areas and their severity.

It should be recognized that cracking and infiltration within a pipe constructed of non-reinforced concrete within a deep tunnel present a significantly more severe structural problem than similar conditions present in typical sewer construction. The Oakland-Macomb Interceptor (OMI) presents a unique situation in determining structural integrity compared to the more common sanitary sewers constructed close to the ground surface using reinforced pipe in open cut trenches. The majority of the OMI was constructed of non-reinforced concrete within a tunnel bored up to 110 feet below grade. The soil conditions within Macomb County through which the tunnel was constructed are a mixture of sand, silty sand and clay which presented both difficulty in maintaining quality control during construction and has lead to severe structural integrity problems within the interceptor since then.

The OMI was constructed in the same time period, using the same design and materials, within the same soil conditions and by the same contactors as was the 15 Mile Road Interceptor. The

15 Mile Road Interceptor has experienced two catastrophic failures – resulting in both major surface damage/disruption and significant sewage discharge – since 1978. And a portion of the Corridor Interceptor required major structural repair due to collapsed pipe.

The NTH inspection revealed numerous locations throughout the Corridor and Avon Arms of the OMI that were currently structurally deficient [PACP ratings of 4 or 5] and which are likely to become severe in the near future [PACP ratings of 3].

It is important to understand the failure mechanism that lead to the collapses of similarly constructed adjacent tunnels to see why "fine soil infiltration" needs to be an appropriate justification in the case of the OMI. After the 15 Mile Road/Edison Corridor failure the U.S. Army Corps of Engineers conducted a failure study. The study concluded that the failure was due to the following:

1. "At the end of construction the concrete liner contained open construction joints and/or cold joints at several locations." [There has been additional cracking since the 1980 study along the entire OMI through which water and fine particulate can flow.]

2. "The fine to medium sands, silty sands, and silts will pipe through openings as narrow as 0.01 inch under water pressure less than 2 psi."

3. "After construction, the external water pressure on the tunnel invert ranged from 4 to 8 psi."

4. "Soil piped into the tunnel in varying amounts depending on the location of the strata of piping soil with respect to the open construction joints and/or cold joints." [Any cracks in the pipe]. "As material piped into the tunnel, the tunnel lost bottom and side support."

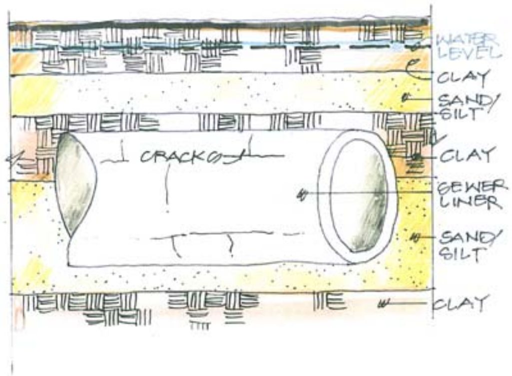
5. "When loss of support occurred beneath the invert, the resulting loading caused the structure" [pipe] "to crack circumferentially."

6. "When loss of support occurred at the springline, the resulting non-uniform loading caused the resistance of the structure to be exceeded and initiated a pattern of ovalling and longitudinal cracking and spalling observed in all distressed areas."

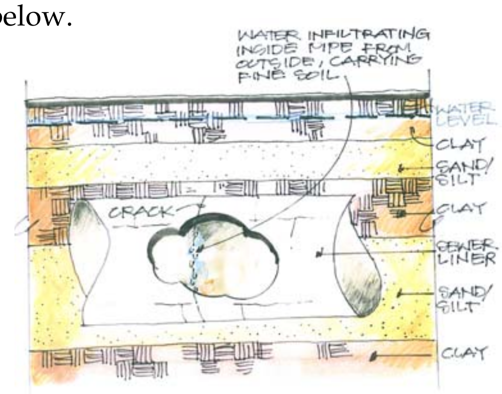
Beyond the undesirable effects of groundwater infiltration on flow, when the infiltration carries even minute amounts of soil into the tunnel structural integrity will be compromised and collapse will be likely. This type of inflow occurs most commonly at the tunnel invert. As soil is removed from under the concrete liner there is a tendency for the tunnel to deflect downward. Since the OMI is constructed without longitudinal reinforcing steel the concrete liner has poor tensile strength and in its attempt to bend will fracture. The bending will result in more numerous and larger cracks which will allow greater soil inflow – and larger voids outside the pipe – eventually leading to collapse.

Thus, even minimal cracks that would be classified as PACP 3 would allow soil infiltration and some loss of exterior pipe support. And, if left unrepaired while nearby severe cracks were repaired, would likely soon increase in size and severity as the high hydrostatic pressure within the groundwater found the "next weakest" point along the tunnel.

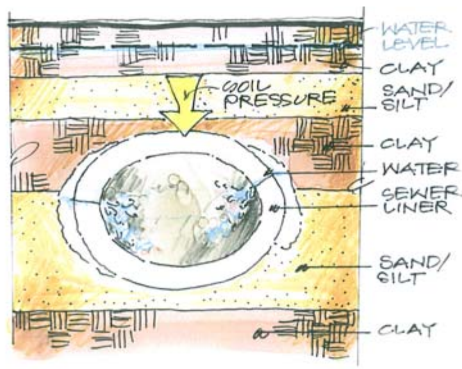
The conditions associated with soil/water infiltration – formation of voids outside the pipe – loss of pipe support – cracking, bending of the pipe, and – eventual pipe collapse are graphically presented through a series of sketches below.



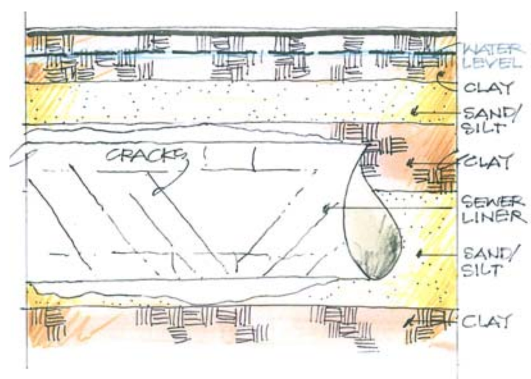
1. Fine cracks develop in monolithic sewer liner.



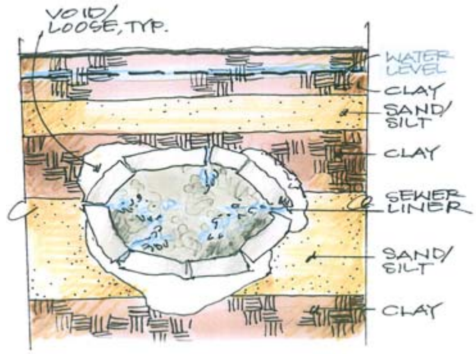
2. Water pressure from outside sewer begins seeping into sewer, carrying soil.



3. Voids and loose zones form around sewer liner. Soil load from above forces sewer to deform into loose zones/voids, which increase crack widths, allowing more soil to infiltrate.



4. Large void develops around sewer liner, sewer may span some distance through large void or loose zone; large dianonal stress cracks develop.



5. Sewer deforms into large voids, loose zones and collapses.

1.4.1 Compliance Status

The Project is the subject of a settlement agreement, oversight and compliance orders before the United States Federal District Court, State of Michigan et al vs City of Detroit, et al, Case No, 77-7100 before the Honorable John Feikens.

1.4.2 Orders

The project is likely to be the subject of a compliance order requiring implementation of the project on a court-ordered schedule. Macomb County has filed a Motion for Order Establishing Compliance Schedule for Repairs to Certain DWSD Interceptors in the case, *United States v. City of Detroit*, Case No. 77-71100. The OMI interceptors are the interceptors that are the subject of the motion. The Motion is pending at the time this Project Plan was printed and is set for hearing on June 29, 2009. The Motion seeks an order establishing a schedule for the structural rehabilitation activities covered by the Project Plan. If granted, the order will impose the schedule on the City of Detroit and any other entity which comes to own or operate those interceptors. Macomb County expects that its motion will be granted. If so, this section of the Project Plan will be updated by July 1, 2009 and a copy of the compliance schedule will added as an exhibit to the Project Plan.

1.4.3 Water Quality Problems

A number of water quality issues have been identified within the Clinton River and its tributaries. They are primarily associated with impacts of urban runoff, illicit discharges, and occasional POTW effluent limit exceedences.

The Clinton River is a Great Lakes Area of Concern (AOC). Several concerns were identified in the initial 1988 Clinton River Remedial Action Plan that described why the river was listed as an AOC. These concerns were (1) conventional pollutants including high fecal coliform bacteria and nutrients, (2) high total dissolved solids, (3) contaminated sediments including heavy metals, PCBs, oil and grease, and (4) impacted biota. Historical point source discharges and some nonpoint sources are responsible for sediment contamination in the main stem Clinton River. Metals, nutrients, petroleum hydrocarbon, PCBs, DDT and other organic compounds reside in the sediments at levels of concern from Pontiac to the mouths of both the river and the spillway, as well as in the Red Run Drain/Plum Brook subwatershed. Many old closed landfills are also of concern. Fecal contamination, including bacteria and nutrients, from wastewater treatment plants was greatly reduced in the years prior to the publication of the 1988 RAP.

Although, historically, industrial and municipal discharges were the primary causes of environmental degradation in the Clinton River, and thus of its designation as an AOC, ongoing contamination problems are almost exclusively of nonpoint source origin.

There are no major industrial discharges to the river or its tributaries of process water (only non-contact cooling water and storm water), and most (though not all) municipalities have adequate industrial pretreatment programs and have implemented combined sewer control plans. As such, storm water runoff as a category is probably the single greatest source of water quality degradation.

Rapid urban expansion and the subsequent loss of habitat is the second significant category of environmental problems related to water quality in the Clinton River watershed. Oakland County and Macomb County have until recently experienced rapid urbanization.

Historical point source discharges and ongoing nonpoint sources are responsible for sediment contamination in the main stem Clinton River. Metals, polychlorinated biphenyls (PCBs), pesticides and other organics have been documented over several decades in a number of locations along the Clinton River from Pontiac to the mouths of both the river and the spillway.

No current identifiable water quality problems are associated with the OMID.

However, failure of this conduit could result in the total loss of sanitary sewage capacity for over 830,000 people in Oakland and Macomb Counties. Failure would prevent flow from being transported to DWSD for treatment. Within hours of even a partial blockage tributary communities would no longer be able to discharge flow to the interceptor. And, to prevent the possibility of massive system backup – into basements –untreated sanitary flows would have be diverted to drains and streams tributary to the Clinton River and Lake St. Clair.

1.4.4 Projected Needs for the Next 20 Years

Population within the overall service area of the OMID is projected to increase slightly over the next 20 years. SEMCOG projections – made before the recent economic downturn – estimated total population as follows:

- 2000 – 775,123
- 2009 – 832,902
- 2015 – 873,159
- 2025 – 907,308
- 2029 – 927,465
- 2035 – 957,701

It is unlikely that these population estimates will be reached due to the severe impact the recession has had on the local economy.

The OMID was designed in the 1960s to serve what was projected to be rapid and extensive urban growth north and especially northeast of Detroit. While expansion did take place during the later decades of the 20th Century this growth has slowed considerably since 2000. Table 1-4, in Section 1.3.1 above, presents year 2009 populations and measured flows by OMID segment and extrapolates those flows to recent – optimistic -- 2030 population projections. It also shows the theoretical design capacity of each segment.

From this comparison it is clear that the existing interceptors have sufficient capacity to convey all existing and future flows throughout the entire length of the OMID.

The critical need for this project stems from the urgent need for rehabilitation throughout much of the OMID total length to prevent catastrophic failure within a short time frame. The following section presents a summary of the findings of NTH and the severity of the pipe condition by segment.

1.4.5 Future Environment without the Proposed Project

Historical tunnel failures in interceptors adjacent to, tributary to and constructed in the same time frame as the OMID raised questions as to the structural integrity of this critical link in the area's sanitary sewage transport system. Customer communities are concerned about continual service being maintained. DWSD contracted with NTH to conduct a comprehensive investigation and evaluation of the condition of the OMID and adjacent interceptors.

Based on this evaluation, the OMID could experience partial or full failure at numerous locations along its alignment. Without the rehabilitation proposed by this project up to 830,000 people could lose sanitary service while millions of gallons of raw sewage could back up into basements or be discharged to the aquatic environment.

NTH inspected OMID, using the following methods, in 2007 and 2008. The Oakland and Avon Arms were inspected using closed circuit television (CCTV), geophysical techniques (multi-channel analysis of surface waves – MASW) and the drilling of test borings. The same methods – plus SONAR – were used to inspect the Corridor Interceptor.

CCTV inspection was performed using float mounted or tractor mounted cameras. A NTH subcontractor – Inland Waters, Inc. (IWI) – conducted the CCTV inspection in the presence of a NTH field representative. Observations were recorded using the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) format. All IWI and NTH field personnel, as well as NTH personnel who reviewed the CCTV recordings, are PACP certified.

The great depth at which the Clinton-Macomb Interceptor tunnel was constructed together with the relatively high water table within Macomb County produced conditions under which moderate to severe pipe defects could be readily identified by observing groundwater infiltration into the tunnel during the CCTV inspection. PACP categorizes groundwater infiltration into four classifications. They are – from most to least severe – described as follows:

- Gusher – Where water enters the sewer under pressure through a defect or failed joint.
- Runner – Where water flows continuously along the pipe wall through a defect or joint.
- Dripper – Where water drips – with no continuous flow – into the pipe through a defect or joint.
- Weeper – Where water is visible on the inner surface of the pipe due to a defect or failed joint, but no dripping is noted.

Runners and Gushers are considered to be most critical due to the likelihood that fine soil material can be washed into the sewer along with the infiltration. Such loss of supporting material can lead to undermining of the pipe and eventual structural failure of the sewer.

NASSCO has used historical data to develop a rating system to define the relative severity of the conditions of pipes being inspected. Two ratings are recognized in the PACP system – one for structural condition and one for O&M purposes. Structural defects include cracks, fractures, breaks, holes, deformation, collapse, joint defects, surface damage, point failures and lining failures. The O&M rating – which considers such things as sediments, roots, obstacles and vermin – is not relevant to the discussion on needed rehabilitation.

The PACP ratings – as they apply to structural evaluations – are shown below.

- Rating 1 – Excellent Condition – Only minor defects, if any present – Failure is unlikely in the foreseeable future.
- Rating 2 – Good Condition – Defects are present but no deterioration has begun – Failure unlikely for at least 20 years.
- Rating 3 – Fair Condition – Moderate defects are present that will worsen – Failure can be expected in 10 to 20 years.
- Rating 4 – Poor Condition – Severe defects are present – Failure in less than 10 years is likely.
- Rating 5 – Pipe has failed or is likely to fail within 5 years.

The OMID – as previously described – was constructed under a number of DWSD contracts designated PCI-5, PCI-6, PCI-7, PCI-8, PCI-9, PCI-10A, PCI-10B and PCI-11A. Structural condition assessments were prepared based on these segments.

Numerous areas with ratings of 4 and 5 were identified. These represent areas where failure can be expected to occur within 10 years without appropriate short-term rehabilitation. Also identified were a large number of areas with ratings of 3 which have less than 20 years of expected service prior to potential failure. Summarized below are the structural deficiencies identified within each PCI segment.

It is apparent that few if any reaches of this critical interceptor can be expected to operate without failure through the next 10 years let alone survive the commonly expected 20 year useful life without rehabilitation.

<u>PCI-5 Edison Corridor from Northeast Sewage Pump Station to Ten Mile Road</u>
Length: 14,630-feet Reaches: 9 Diameter: 12'-9" Material: Cast-in-Place Concrete Pipe

The following observations were made during the CCTV inspection of PCI-5:

- PACP Condition 4 – due to severe surface scaling including missing aggregate was noted at 6 locations and continuous severe scaling in 3 extended areas 95, 1037 and 45 feet in length.

- PACP Condition 4 – due to running infiltration potentially causing soil loss surrounding the pipe was noted at 9 locations.
- PACP Condition 4 – due to visible high water marks at or greater than the spring line of the pipe was noted in multiple reaches.
- PACP Condition 3 – due to dripping infiltration was noted at 22 locations.
- PACP Condition 3 – due to multiple localized cracks was noted at 8 locations.
- PACP Condition 3 – due to medium to severe scaling with protruding aggregate was noted at 12 locations many of which were continuous.

Subsequent MASW analysis was performed along the length of PCI-5 except where surface conditions prohibited. These geophysical investigations confirmed the likelihood of loose soil and/or voids adjacent to the sewer in at least 12 locations – one of which appears to be at least 200 feet in length. At least 3 of these locations directly correlate with locations of CCTV observed cracks and fractures.

Plan and Profile drawings showing the identified problem areas in PCI-5 are included in Appendix B– Section 1.

<u>PCI-6 Edison Corridor from Ten Mile Road to Common Road</u>
Length: 13,033-feet Reaches: 8 Diameter: 12’-9” Material: Cast-in-Place Concrete Pipe

The following observations were made during the CCTV inspection of PCI-6:

- PACP Condition 4 – due to severe surface scaling including missing aggregate was noted at 18 locations and continuous severe scaling in 11 extended areas 22, 32, 64, 27, 14, 23, 10, 25, 23, 20 and 22 feet in length.
- PACP Condition 4 – due to running infiltration potentially causing soil loss surrounding the pipe was noted at 2 locations.
- PACP Condition 4 – due to visible high water marks at or greater than the spring line of the pipe was noted in multiple reaches.
- PACP Condition 3 – due to dripping infiltration was noted at 18 locations.
- PACP Condition 3 – due to multiple localized cracks was noted at 14 locations.
- PACP Condition 3 – due to medium to severe scaling with protruding aggregate was noted at 31 locations many of which were continuous.

Subsequent MASW analysis was performed along the length of PCI-6 except where surface conditions prohibited. These geophysical investigations confirmed the likelihood of loose soil and/or voids adjacent to the sewer in at 30 locations – including 9 that extend considerable lengths as follows: 200, 200, 300, 1000, 280, 500, 1100, 400, and 1100 feet. At least 13 of these locations directly correlate with locations of CCTV observed cracks and fractures.

Plan and Profile drawings showing the identified problem areas in PCI-6 are included in Appendix B – Section 2.

PCI-7 Edison Corridor from Common Road to Fifteen Mile Road

Length: 13,627 -feet Reaches: 11 Diameter: 12'-9" Material: Cast-in-Place Concrete Pipe

Two of the reaches were lined with a 9'-0" precast concrete pipe in 1981 when severe structural failures were identified. This reduced diameter segment remains problematic since the pipe invert does not maintain a consistent slope – thus trapping sediment and slime at the lip of the lining pipe fostering the production of hydrogen sulfide which in turn caused pipe lining deterioration.

The following observations were made during the CCTV inspection of PCI-7:

- PACP Condition 5 – due to exposed and corroding reinforcing steel was noted at 2 locations; due to visible reinforcing steel at 11 locations; and due to continuously visible reinforcing steel in two extended areas each about 5 feet in length.
- PACP Condition 4 – due to severe surface scaling including missing aggregate was noted at 15 locations.
- PACP Condition 4 – due to running infiltration potentially causing soil loss surrounding the pipe was noted at 8 locations.
- PACP Condition 4 – due to visible high water marks at or greater than the spring line of the pipe was noted in multiple reaches.
- PACP Condition 4 – due to a vertical alignment transition was noted at one location.
- PACP Condition 3 – due to dripping infiltration was noted at 43 locations.
- PACP Condition 3 – due to multiple localized cracks was noted at 34 locations.
- PACP Condition 3 – due to medium to severe scaling with protruding aggregate was noted at 19 locations many of which were continuous.

Subsequent MASW analysis was performed along the length of PCI-7 except over the Red Run Drain. These geophysical investigations confirmed the likelihood of loose soil and/or voids adjacent to the sewer in at least 14 locations – two of which appear to be 200 and 300 feet in length. At least 7 of these locations directly correlate with locations of CCTV observed cracks and fractures.

Plan and Profile drawings showing the identified problem areas in PCI-7 are included in Appendix B – Section 3.

PCI-8 Fifteen Mile Road & Edison Corridor to Dodge Park Road & Utica Road

Length: 17,639-feet Reaches: 12 Diameter: 9'-6" Material: Cast-in-Place Concrete Pipe

The following observations were made during the CCTV inspection of PCI-8:

- PACP Condition 5 – due to gushing infiltration was observed at 3 locations.
- PACP Condition 5 – due to severe scaling including visible reinforcement was observed in 1 continuous area 25 feet in length.

- PACP Condition 4 – due to running infiltration was identified at 19 locations.
- PACP Condition 3 – due to dripping infiltration was observed at 98 locations.
- PACP Condition 3 – due to multiple localized cracks was observed at 32 locations.
- PACP Condition 3 – due to longitudinal fractures was observed in 2 locations as well as over a continuous segment 41 feet in length.
- PACP Condition 3 – due to medium to severe scaling including projecting and visible aggregate was observed at multiple locations.

Subsequent MASW analysis was performed on four reaches of PCI-8. The reaches were 2,700, 2,000, 900, and 1,400 feet in length and were selected to correspond with locations of running and gushing leaks previously identified. These geophysical investigations confirmed the likelihood of loose soil and/or voids adjacent to the sewer in at least 17 locations – one of which appears to be at least 40 feet in length. At least 7 of these locations directly correlate with locations of CCTV observed cracks and fractures.

Plan and Profile drawings showing the identified problem areas in PCI-8 are included in Appendix B – Section 4.

PCI-9 Utica Road & Dodge Park Road to Clinton River Road
Length: 17,960-feet Reaches: 11 Diameter: 8'-9" Material: Cast-in-Place Concrete Pipe

The following observations were made during the CCTV inspection of PCI-9:

- PACP Condition 5 – due to gushing infiltration was observed at 1 location.
- PACP Condition 5 – due to a hole visible in a joint was observed in 1 location.
- PACP Condition 4 – due to running infiltration was identified at 9 locations.
- PACP Condition 3 – due to dripping infiltration was observed at 91 locations.
- PACP Condition 3 – due to multiple localized cracks was observed at 5 locations, and within 4 continuous sections with lengths of 107, 24, 50 and 22 feet.
- PACP Condition 3 – due to medium to severe scaling including projecting and visible aggregate was observed at 3 locations, and within 2 continuous sections with lengths of 33 and 48 feet.

MASW analysis was not performed along the length of PCI-9.

PCI-10A Clinton River Rd & M-59 to 2,300 Feet West of Ryan Rd in River Bends Park
Length: 16,300-feet Reaches: 10 Diameter: 8'-0" Material: Cast-in-Place Concrete Pipe

The following observations were made during the CCTV inspection of PCI-10A:

- PACP Condition 5 – due to gushing infiltration was observed at 4 locations.

- PACP Condition 5 – due to severe scaling including visible reinforcement was observed in 2 locations.
- PACP Condition 4 – due to running infiltration was identified at 8 locations.
- PACP Condition 4 – due to high water marks at or greater than the spring line of the pipe was observed in numerous reaches.
- PACP Condition 3 – due to dripping infiltration was observed at 80 locations and continuously at joints and cracks as well as through plugged lift holes in 6 locations..
- PACP Condition 3 – due to multiple localized cracks was observed at 2 locations as well as over 1 continuous segment 7 feet long.
- PACP Condition 3 -- due to medium to severe scaling including projecting and visible aggregate was observed at 1 location, and within 7 continuous sections with lengths of 24, 20, 25, 43, 97, 287 and 33 feet.

MASW analysis was not performed along the length of PCI-10A.

Plan and Profile drawings showing the identified problem areas in PCI-10A are included in Appendix B – Section 5.

<u>PCI-10B In River Bends Park from 2,300 Feet West of Ryan Rd to Dequindre Rd near Avon Rd</u>
Length: 5,600 -feet Reaches: 4 Diameter: 8'-0" Material: Cast-in-Place Concrete Pipe

The following observations were made during the CCTV inspection of PCI-10B:

- PACP Condition 5 – due to gushing infiltration was observed at 1 location.
- PACP Condition 4 – due to running infiltration was identified at 11 locations.
- PACP Condition 4 – due to high water marks at or greater than the spring line of the pipe were observed in numerous reaches.
- PACP Condition 3 – due to dripping infiltration was observed at 34 locations.
- PACP Condition 3 – due to multiple localized cracks was observed at 2 locations.
- PACP Condition 3 – due to medium to severe scaling including projecting and visible aggregate was observed at 4 locations, and within 3 continuous sections with lengths of 55, 63 and 200 feet.
- PACP Condition 3 – due to the outline of reinforcement being visible at 3 locations.

MASW analysis was not performed along the length of PCI-10B.

Plan and Profile drawings showing the identified problem areas in PCI-10B are included in Appendix B – Section 6.

PCI-11A (Avon Arm Interceptor) M-59 & Utica Rd to Dequindre Rd and M-59

Length: 14,170 -feet Reaches: 35 Diameter: Various (36", 42", 48") Material: Precast Concrete Pipe

The following observations were made during the CCTV inspection of PCI-5:

- PACP Condition 5 – due to gushing infiltration was observed at 1 location.
- PACP Condition 5 – due to severe scaling including visible reinforcement was observed in 4 locations.
- PACP Condition 5 – due to severe scaling including protruding reinforcement was observed at one location.
- PACP Condition 4 – due to bends in the sewer greater than 20 degrees was identified at 15 locations.
- PACP Condition 4 – due to high water marks at or greater than the spring line of the pipe was observed in 23 reaches.
- PACP Condition 4 – due to running infiltration was identified at 7 locations.
- PACP Condition 4 – due to severe scaling including missing aggregate was observed in two continuous sections 13 and 5 feet in length as well as at one manhole,
- PACP Condition 4 – due to multiple fractures was identified at 2 locations.
- PACP Condition 3 – due to dripping infiltration was observed at 54 locations.
- PACP Condition 3 – due to multiple localized cracks was observed at 2 locations and in 1 continuous section 20 feet in length
- PACP Condition 3 – due to diagonal cracks was observed in 2 locations.
- PACP Condition 3 – due to medium to severe scaling including projecting and visible aggregate was observed at 63 locations.
- PACP Condition 3 – due to mortar missing from pipe joints at 79 locations.

MASW analysis was not performed along the length of PCI-11A.

Plan and Profile drawings showing the identified problem areas in PCI-11A are included in Appendix B – Section 7.

1.5 POPULATION DATA

Oakland and Macomb Counties have, within the last few decades, shown some of the highest population growth rates within the State of Michigan. Oakland County total population has grown by an average of almost 11% per decade between 1970 and 2000; and Macomb County total population has grown by an average of almost 9% per decade between 1970 and 2000. Over the past nine years these rates have been greatly reduced. Oakland County has increased in population only 0.76% between 2000 and 2009. Macomb County grew 5.75% over the same period.

Table 1-5 shows Oakland and Macomb County populations from each of the past four censuses plus the SEMCOG estimated 2009 population.

Table 1-5: Oakland & Macomb County Historical Total Population (SEMCOG, March 2009)

		Oakland County	Macomb County
1970	**Census**	907,871	625,309
1980	**Census**	1,011,793	694,600
1990	**Census**	1,083,592	717,400
2000	**Census**	1,194,156	788,149
2009	**SEMCOG**	1,203,178	833,430

Population of those communities currently tributary to the OMID have grown under 7.5% between 2000 and 2009. And, even the SEMCOG projection sees less than a 15% increase over the next 26 years – to 2035.

Table 1-6 shows recent and projected populations of all communities currently tributary to the OMID from both Oakland and Macomb Counties. Values shown are from the 2000 Census, the February 2009 SEMCOG estimate, and the SEMCOG projections for 215, 2025 and 2035. Estimates for year 2029 were interpolated between the 2025 and 2035 values..

Table 1-6: OMID Tributary Communities & Projected Population (SEMCOG, March 2009)

		Oakland County	Macomb County	OMID Total
2000	**Census**	332,072	443,051	775,123
2009	**SEMCOG Estimate**	340,943	491,959	832,902
2015	**SEMCOG Projection**	353,566	519,593	873,159
2025	**SEMCOG Projection**	368,314	538,994	907,308
2029	**Interpolated**	377,942	549,794	927,465
2035	**SEMCOG Projection**	392,385	565,994	957,701

As previously discussed the recent economic downturn may make the above projections optimistic. Unless significant economic improvement creates replacement jobs for displaced automotive industry workers the slight projected growth could just as likely become significant population loss due to outmigration of displaced workers to other parts of the country.

1.6 ENVIRONMENTAL SETTING

1.6.1 Cultural Resources

The Native Americans settled in the Great Lakes Basin over 10,000 years ago and the project area consisted of three major Nations including the Ojibwa, Ottawa, and Potawatomi (Clinton River Watershed Council, March 2009). There are a number of sites in the region that are on the National and State Historical Register, and/or of local significance. However, the area that will be affected by the OMID replacement project does not contain any known historical or archaeological sites based on the applicant's preliminary review of existing information. This project is rehabilitating existing pipe within designated right-of-ways and will not be disturbing any areas of National/State/Local significance. Information regarding this project has been forwarded to the local Tribes and State Historical Preservation Office (Appendix D-1 & D-2). Four Native American Tribes have responded indicating that there are no significant features in this area to their knowledge (Appendix D-1).

1.6.2 The Environmental Setting

Cultural Resources

Oakland and Macomb Counties are rich in natural resources, and Lake St. Clair, its shoreline, boating, fishing and other recreational and economic advantages is a big reason people are attracted to the area. Accordingly, the quality of life in this area is dependent upon the conditions of air, water, and land. This project is designed to maintain the quality of living and minimize risks of disturbing the natural environment.

Climate

The climate will not affect the project. Construction techniques used in sewer projects are not normally affected by weather and the construction will be staged and timed so that construction and final stabilization will be done in the appropriate seasons.

Air Quality

The project is not anticipated to adversely impact the air quality in the District. Currently, there is six air monitoring site within the Oakland and Macomb Counties.

- Oak Park (261250001)
- Pontiac (261250011)
- Sterling Heights (260990021)
- Rochester (261250012)
- Warren (260991003)
- New Haven (260990009)

Wetlands

There are wetlands throughout the project area as shown in Figure 5. Construction staging areas are not within wetland boundaries.

Coastal Zone

The project is inland and not in a Coastal Zone and it will not impact these types of resources.

Floodplains

Approximately a third of the OMID runs along the Clinton River and is located within the floodplain. Although the OMID is located beneath a floodplain construction activity will placed outside of these areas. The FEMA floodplains in the project area are shown in Figure 5. Information has been forwarded to the Michigan Department of Environmental Quality regarding potential impacts (Appendix D-3)

Natural or Wild Scenic Rivers

There are no natural, wild or scenic rivers in the project area or that will be impacted by the project.

Major Surface Water

As noted above, the majority of the study area coincides with the Clinton River Watershed and portions of Chesterfield, Lenox, and Harrison Townships are tributary to small streams or County drains discharging to Anchor bay of Lake St. Clair. Portions of Richmond, Richmond Township as well as Memphis and Romeo are within the Belle River Watershed. The Project will cross the Red Run Creek in the Clinton River Watershed, however, proposed pipelining methods will be used and therefore, not disturb the natural surroundings and creek.

Approximately a third of the OMID runs along the Clinton River and BMPs will be placed before construction starts to minimize effects on the River. Figure 3 shows the location of the project area significant water features.

Recreational Facilities

The study area has an abundance of parks and recreational areas. Figure 6 shows the location of recreational areas within the study area.

There will be one construction location, PCI-9 Gate Access (#5) that will be located in the right-of-way south of the Dodge Brothers State Park 8, Sterling Heights, MI parking areas. This will have minimal impact to these locations as construction will be coordinated with City and Park operations and are not directly in-line with the parking lots.

Topography

The topography in the project area ranges from 984' to 574' above sea level. Because the sewer is already constructed there is not topography changes required for this project.

Geology

The Project area lies along the western edge of what is known as the "Maumee Lakeplain". The highland areas in the northwest portion of the project area are part of the "Fort Wayne – Defiance Moraines", a series of end moraines that formed at the stationary front of a glacier where till was continuously deposited.

The geology in the project area will not adversely affect the construction of the project nor did it affect the selection of alternatives.

Soils

There are more than 62 distinct soil types in Macomb and Oakland Counties alone. The soil types will not affect construction nor did they significantly influence the choice of the selected alternative.

Agricultural Resources

There are no Unique or Prime Farmlands that will be impacted by the project. The project is for restricted to the existing right-of-way and the sewer is not in active farmland.

Fauna and Flora

The project area is primarily dense residential and disturbed open space and the flora and fauna is typical of suburbia in the region. There are no known sensitive habitats or threatened or endangered species. A review by the Michigan Natural Features Inventory has been requested and additional information will be included as received (Appendix D-4).

Unique Features

There are no unique features in the project area. As indicated, most of the work will be done in the existing right-of-way with very little disturbance to areas outside of the ROW.

2.0 Analysis of Alternatives

2.1 IDENTIFICATION OF POTENTIAL ALTERNATIVES

The ultimate need that must be fulfilled by any alternative is the environmentally appropriate and economically acceptable transport and treatment of sanitary sewage from much of Oakland and Macomb Counties. An expedient method of meeting this need is continuing to use the existent interceptor and transport sewage to DWSD. Yet this method – without rehabilitation – cannot expect to provide complete, reliable, uninterrupted service for more than a few years.

This interceptor is a key component of the Regional Alternative analysis called for in preparation of this Project Plan.

The following Alternatives will be discussed:

- Alternative One -- No Action
- Alternative Two -- Replacement
- Alternative Three -- Rehabilitation of Interceptor (Optimal Performance)

2.2 ANALYSIS OF PRINCIPAL ALTERNATIVES

2.2.1 Alternative One -- No Action

The No Action Alternative would leave the Oakland-Macomb Interceptor Drain in its current condition. No rehabilitation would be performed and identified problematic areas would remain unaltered. Under this alternative, suburban communities would continue to discharge flows into the existing conduit without the construction of flow control facilities or attention being given to deteriorated pipe segments. Since no collapsed sections have been identified currently flows are not restricted and no immediate modifications would seem to be required.

Monetary Evaluation
The capital cost of this alternative is zero. The Present Worth Analysis is included in Appendix C-Section 1.

Staging Construction
Staging Construction is not applicable to be evaluated under the No Action Alternative.

Partitioning the Project
Partitioning the Project is not applicable to be evaluated under the No Action Alternative.

Environmental Evaluation
The environmental consequences of the No Action Alternative are potentially severe. Since identified deterioration in numerous sections of the OMID are critical in nature the potential for catastrophic collapse at any time is high. Associated with any significant collapse – or similar

failure – would be the blockage of flow within the interceptor sewer. As was previously described, the OMID carries up to 120 cfs average flow.

Up to 830,000 customers rely on the OMID as the sole means of transporting sanitary sewage to DWSD for treatment. If blocked the interceptor would quickly fill and prevent suburban customer communities from discharging flow. With no alternative transport facility in place, and no provision for detaining sanitary sewage, all sanitary flow would need to be bypassed directly to receiving waters to prevent massive, widespread basement flooding.

If the blockage were to occur south of Fifteen Mile Road [PCI-5, PCI-6 or PCI-7] in the portion of the OMID known as the Corridor Interceptor none of the tributary flow would be able to reach DWSD. This would result in discharge of over 84 MGD of untreated sanitary sewage directly to receiving waters or to storm drains tributary to the Clinton River. The locations of the discharges would be widespread throughout the suburbs that discharge to the OMID. Environmental damage would occur to substantially all portions of the Clinton River Watershed and Lake St. Clair.

Blockage above Fifteen Mile Road would result in less total overflow since some communities would still be able to transmit flow to DWSD through the Corridor Interceptor portion of the OMID. However, the local effects of the blockage would remain the same. All flows from communities upstream of the break would risk being bypassed directly to the environment. And, substantially all Clinton River Branches – except the Middle and North Branches – would be at risk from sanitary sewage bypass.

While uncertain as to specific location or timing, the eventual environmental impact of the No Action Alternative will be the failure of the interceptor at one or more locations resulting in significant environmental impairment and severe public health impacts.

Implementability and Public Perception

Obviously the No Action Alternative would be easiest to 'implement.' And, initial Public Perception would not be altered since things would go on as normal. However the potential public impact of system failure, sewage bypass or – especially – basement flooding would be unacceptable.

Specific public comment information may be found in Section 6 below.

Technical and Other Considerations

Infiltration and Inflow – I/I into the OMID has been observed as part of the in-depth inspections that have been completed. No specific quantification was made as to the volume entering the interceptor. All flows within the interceptor are well within design criteria, and flows from the OMID to DWSD are within contract capacity. Inflow at numerous locations is serious enough to be causing surrounding soils to be carried into the pipe and cause voids surrounding the tunnel. These voids, together with the deterioration of the pipe structure strongly suggest the likelihood of potential structural failure and catastrophic collapse of numerous sections of the OMID.

Sludge and Residuals – Sludge and Residuals are not a factor for these facilities that only transport sewage.

Industrial Pretreatment – Industrial Pretreatment is not a factor for these facilities that only transport sewage.

Growth Capacity – Based on the projected changes in population of areas tributary to the OMID – including the potential expansion of the MCWDD to include Ray Township -- the OMID has sufficient hydraulic capacity to handle flows. However, as previously stated, under the No Action Alternative this capacity can be catastrophically reduced or eliminated due to pipe failure.

Reliability – The No Action Alternative fails to demonstrate the ability to meet and consistently maintain reliable transport of sanitary sewage from suburban customers to DWSD for treatment in the short term, let alone throughout the 20 year planning period.

Alternative Sites and Routings – Alternative Sites and Routings are not applicable to be evaluated under the No Action Alternative.

Combined Sewer Overflows (CSO) – CSO is not an issue with the OMID since only separate sanitary sewage is transported.

Contamination at the Project Site – Contamination at the Project Site is not applicable to be evaluated under the No Action Alternative.

2.2.2 Alternative Two – Full Replacement

Full replacement would insure that the entire interceptor system would be reconstructed and the entire facility would maintain a useful life of at least 20 years. Figure 7 shows the route of the existing OMID, the conceptual route of a Full Replacement interceptor.

Monetary Evaluation
The capital cost of this Full Replacement is estimated to be approximately $500 Million. The Present Worth Analysis is included in Appendix C – Section 2 and results in a Present Worth Value of approximately $206.9 Million for Full Replacement.

Staging Construction
Staging Construction is not applicable to be evaluated under the under this alternative since the entire facility will be needed to transport flow throughout the planning period. The intent of the project is to provide an interceptor facility with a minimum useful life of 20 years.

Partitioning the Project
Partitioning the Project is not applicable to be evaluated under the Full Replacement option since the entire interceptor must be in place to receive and transport flow to DWSD.

Environmental Evaluation
The environmental consequences of the Replacement Alternative are significant. This option

would construct an entirely new conduit that would be structurally sound and alleviate the potential catastrophic failure identified in the No Action Alternative. However, the short term impacts of major construction would require large scale environmental mitigation.

The route of the replacement interceptor would most efficiently run parallel to – and in close proximity to – the existing alignment. In the upper portions of the route [historical contracts PCI-9, PCI-10A, and PCI-10B] the interceptor closely parallels the Clinton River and is located below parkland that is largely floodplain or wetland.

Construction in these upper reaches would likely be done by open cut methods requiring miles of disruption and mechanical dewatering. These activities would have major detrimental impacts on the ecosystem. Extensive restoration efforts would likely be required to allow the floodplain and wetlands to return to functioning ecosystem components.

In the middle portions of the route [PCI-8] the alignment follows road rights-of-way through highly urbanized areas. The preliminary alignment used to prepare this analysis is shown on Figure 7. It is conceptual in nature – intended to provide a basis to estimate costs and benefits of the alternative. In these areas easements for construction of tunnel access points will need to be obtained. Surface disruption will be severe in these locations and heavy truck traffic will be required to remove earth spoil from the tunneling operations.

In the lower portions of the route [PCI-5, PCI-6 and PCI-7] the newly constructed would need to be constructed within a newly obtained easement within the ITC [formerly Detroit Edison] power transmission line corridor. Similar tunnel access points will be required in this area, and surface disruption of the privately owned open-space created by the corridor would be required. Heavy truck traffic would be required through highly urban areas to transport earth spoil from the tunneling operations.

Implementability and Public Perception

Construction of a major interceptor through the urbanized northern Detroit suburbs – those technically feasible – would be faced with major implementation hurdles. Since a new route would have to be established through a number of communities right-of-way and easement procurement would be difficult.

Construction activities would be disruptive to the community. Heavily traveled roadways would be required to handle the hundreds of trucks needed to remove the estimated 500,000 cubic yards of material excavated for the new interceptor.

Specific public comment information may be found in Section 6 below.

Technical and Other Considerations

Infiltration and Inflow – I/I into a newly constructed replacement to the existing OMID can be expected to be minimal – near zero – due to the modern construction techniques that would be implemented. All flows within the interceptor would remain within design criteria, and flows from the OMID to DWSD would stay within contract capacity.

Sludge and Residuals – Sludge and Residuals are not a factor for these facilities that only transport sewage.

Industrial Pretreatment – Industrial Pretreatment is not a factor for these facilities that only transport sewage.

Growth Capacity – Based on the projected changes in population of areas tributary to the OMID – including the potential expansion of the MCWDD to include Ray Township -- the existing OMID has sufficient hydraulic capacity to handle flows. This Replacement Alternative has been based on construction of a new interceptor of like capacity and thus would also provide sufficient capacity for anticipated 20 year population changes.

Reliability – The Replacement Alternative consists of construction of new tunnel specifically designed to meet and consistently maintain reliable transport of sanitary sewage from suburban customers to DWSD for treatment in the short term and throughout the 20 year planning period.

Alternative Sites and Routings – The conceptual route identified for the Replacement Alternative is the most practical since it parallels the existing sewer and allows for expeditious connection of customer community systems. From a conceptual – planning – perspective the route used for costing and evaluation would be comparable to any slightly modified route.

Combined Sewer Overflows (CSO) – CSO is not an issue with the OMID since only separate sanitary sewage is transported.

Contamination at the Project Site – No significant contamination at the Project's Construction Sites is anticipated. However, working in an urban area local 'hot spots' may occur and contingencies for disposal of contaminated soil from near surface access points would need to be made.

2.2.3 Alternative Three -- Rehabilitation of Interceptor (Optimal Performance)

The Rehabilitation Alternative consists of a series of coordinated efforts that are intended to allow the existing OMID conduit to be physically rehabilitated to assure optimal performance, hydraulic capacity, and structural stability such that the entire facility maintains a useful life of at least 20 years.

Rehabilitation efforts are closely tied to the findings of the evaluation performed by NTH and described previously in this plan. The effort requires considerable labor inside the OMID tunnel which continually transports sanitary sewage from suburban communities to DWSD for treatment. To effectively undertake the needed rehabilitation flow must be controlled within the system. To allow for systematic retention of flow – allowing workers to enter the tunnel – a series of flow control gates are planned to be constructed. The gates will prevent – or restrict – flows from moving downstream. This will utilize upstream pipe capacity as storage and provide for work to be completed 'in the dry' within downstream segments. Since the capacity of the tunnel is limited the holding time available within the system will similarly be limited to only a few hours at a time. Construction methods selected must allow for use of methods and materials able to be installed in segments over time and that can be immersed under water within hours of installation. A detailed evaluation of Rehabilitation methods is provided in Section III which describes the Preferred Alternative.

Monetary Evaluation

The capital cost to Rehabilitate the Interceptor is estimated to be about $144,601,000. The Present Worth Analysis for this alternative is included in Appendix C – Section 3 and results in a Present Worth Value of $59.9 Million for Interceptor Rehabilitation.

Staging Construction

Staging Construction is not applicable to be evaluated under the under this alternative since the entire facility will be needed to transport flow throughout the planning period. The intent of the project is to provide an interceptor facility with a minimum useful life of 20 years.

Partitioning the Project

Partitioning the Project is usually applicable to be evaluated when portions of the overall project are not required to be constructed initially in order to meet the 20 year planning horizon. Since the entire interceptor must be in place to receive and transport flow to DWSD partitioning could only be considered if Interceptor Rehabilitation were to be completed on only the most severely degraded sections of the interceptor first – followed by similar rehabilitation on less severe sections at a later date. All proposed Rehabilitation activities are required to bring the facility up to a 20 year useful life Partitioning has not been proposed as part of this Project Plan.

Environmental Evaluation

The environmental consequences of the Interceptor Rehabilitation are minimal. Only the localized short term impacts of surface construction at control gates and interceptor access locations would take place.

Surface disruption would be generally confined to existing rights-of-way, staging areas and easements. Only one segment of the sewer within PCI-5 is recommended for replacement. And, this area would be completed in tunnel.

Considerable rehabilitation work is needed within the original PCI-9 which is located in parkland along the Clinton River. Construction of a control gate will be required in this area – which will require mitigation of construction site disruption. Access for pipe rehab will be from the control gate structure and existing manholes to minimize environmental impact.

Implementability and Public Perception

All construction activity is accompanied by localized access and staging issues. The majority of the proposed work under the Rehabilitation Alternative will take place inside the existing tunnel – and access points will be within existing rights-of-way and ITC corridor easement. Because of this construction staging and project implementation should pose minimal problems.

Construction activities would have minimal disruptive impact on the community. Except for the construction of control gates no new excavation will be required and only minor construction traffic would be seen on area roadways.

Specific public comment information may be found in Section 6 below.

Technical and Other Considerations

Infiltration and Inflow – I/I into a newly Rehabilitated OMID can be expected to be minimal due to the modern lining techniques that would be implemented. The intent of the Rehabilitation effort is to repair all pipe segments where infiltration was identified during the NTH evaluation. While complete elimination of all I/I is an unrealistic goal this effort can be expected to reduce interceptor I/I to a small fraction of existing excess flow. All flows within the interceptor would remain within design criteria, and flows from the OMID to DWSD would stay within contract capacity.

Sludge and Residuals – Sludge and Residuals are not a factor for these facilities that only transport sewage.

Industrial Pretreatment – Industrial Pretreatment is not a factor for these facilities that only transport sewage.

Growth Capacity – Based on the projected changes in population of areas tributary to the OMID – including the potential expansion of the MCWDD to include Ray Township, Bruce Township, Armada Township, and Richmond Township-- the existing OMID has sufficient hydraulic capacity to handle flows. This Rehabilitation Alternative will somewhat reduce the cross-sectional area of the interceptor but not markedly reduce its effective capacity. Thus the proposed facility would also provide sufficient capacity for anticipated 20 year population changes.

Reliability – The Rehabilitation Alternative consists of the installation of modern tunnel lining materials using techniques that are specifically designed to create and consistently maintain pipe surfaces and structure capable of providing reliable transport of sanitary sewage. Completing of the Rehabilitation Alternative will assure suburban customers that their flow will be conveyed to DWSD for treatment throughout the 20 year planning period.

Alternative Sites and Routings – All construction associated with the Rehabilitation Alternative will take place within the current interceptor – or in one location immediately adjacent to the existing alignment. No alternative sites or routes are applicable to this alternative.

Combined Sewer Overflows (CSO) – CSO is not an issue with the OMID since only separate sanitary sewage is transported.

Contamination at the Project Site – No significant contamination at the Project's Construction Sites – where flow control structures will be installed – is anticipated. However, working in an urban area local 'hot spots' may occur and contingencies for disposal of contaminated soil from near surface access points would need to be made.

3.0 Selected Alternative

3.1 DESCRIPTION OF THE SELECTED ALTERNATIVE

Alternative Three – Rehabilitation of the Existing Interceptor is deemed to be the most cost-effective, environmentally sound and implementable method of providing sanitary sewage transport from the C-OSDS and the MCWDD to DWSD for treatment (Table 3-1).

The "No Action" alternative was dismissed due to the significant likelihood of tunnel collapse and associated environmental, economic, and community disruption that would be caused.

The "Rehabilitation" and "Replacement" options were compared and it was determined that the Rehabilitation option was most cost effective – besides having less environmental impact and community disruption. The table below presents the comparison of Present Worth of the two options. It is clear that the Rehabilitation Option is the least cost choice.

Table 3-1: Cost Effectiveness / Present Worth Analysis

		Replacement Option	Rehabilitation Option
Total Capital Costs	(a)	$ 499,000,000	$ 144,601,347
OM&R Costs			
Annual OM&R		$ 832,529	$ 832,529
Present Worth OM&R	(b)	$ 10,829,484	$ 10,829,484
Salvage Value (at 20yrs of a 50yr life)		$ 299,400,000	$ 86,760,808
PW of Salvage Value	(c)	$ 182,715,120	$ 35,974,750
Total Present Worth a+b-c	(d)	$ 327,114,364	$ 119,456,081

Total present worth, used to compare alternatives, is the sum of the initial capital cost plus the present worth of operation, maintenance, and replacement (OM&R) costs minus the present worth of the salvage value at the end of the 20-year planning period.

In 2008 NTH Consultants, Ltd. prepared a report covering their evaluation of these interceptors and recommending specific flow control and rehabilitation methods to be used on a section by section basis. The following summarizes the recommendations of this report.

3.1.1 Relevant Design Parameters

The OMID is the sole means of conveyance for all sanitary flow generated in the C-OSDS and MCWDD. All rehabilitation work must be performed either while maintaining flow through the pipe or during periods when flow can be temporarily held back – using excess pipe volume as storage capacity. Flow control will be a critical component of the selected rehabilitation strategy. Repair of existing gate structures and construction of new control gates will be required. A hydraulic evaluation of all flows within the interceptor will be performed to verify the proposed control gate locations and to set final construction sequencing parameters defining maximum storage times that will limit access periods for rehabilitation construction.

The existing control gate on the Corridor Interceptor [PCI-7] has been determined to require repair in order to effectively hold flow in upstream segments. Also, to allow flow to be managed appropriately during construction, four new control gate structures will need to be constructed. They are located at: the upstream end of PCI-9 – near Utica Rd and M-59; within PCI-8 – in the Dequindre Road R-O-W near 16 ½ Mile Rd; at the upper end of PCI-6 – in the ITC Corridor at 12 ½ Mile Road; and between PCI-5 and PCI-6 – in the ITC Corridor at Ten Mile Road. Sequencing of construction for these control structures as well as for the rehabilitation work itself has been preliminarily defined – and is presented in Section 3.1.7 below. However, final sequencing and construction constraints will be further defined through detailed hydraulic analysis.

3.1.2 Controlling Factors

Pipe condition, severity of degradation, minimum and maximum flow volumes [levels], the ability to fully retain flow, and the amount of time flow can be stopped all effect the methods that can be employed for sewer pipe rehabilitation. NTH reviewed a number of methods available for repairing various portions of the OMID and presented the results in their evaluation reports. Below are relevant excerpts from the discussions on the following repair methods:

1. Cured-in-Place Pipe (CIPP) Liner
2. Sliplining
3. Localized Repairs
4. Panel Lining
5. Spiral Wound Pipe
6. Cementitious Mortar Coating / Shotcrete

<u>CIPP Liner</u>

Installation of CIPP liner involves the insertion of a resin-impregnated fabric tube into an existing sewer using water, air inversion, or winching techniques. Once the pipe is installed and expanded to meet the existing inside of the pipe, the resins are cured with the introduction of heated water, steam or ultraviolet light. This method of lining has been available in the United States for approximately 30 years.

During the installation and curing process, flow in the sewer must either be stored or by-passed around the work area. Literature indicates that this method is applicable for pipe diameters ranging from 4 inches to 108 inches (9 feet). Connections from laterals or other sewers have to be re-opened once the CIPP liner cures and the end sections of the liner must be sealed to prevent water from being forced behind the liner. While there is some loss in the pipe cross section from the new liner, the manufacturer's literature indicates that the CIPP has reduced friction factor that somewhat mitigates the reduction in cross section. As such, lined pipes typically have a flow capacity similar to non-lined pipes.

The principle concerns associated with the use of the CIPP liners are the curing of the liner and the removal of the ends of the liner within anticipated work windows. Based on published literature, it appears that the physical installation of the liner for the longest individual reach within the OMID to be lined could be installed in approximately half an hour. With respect to curing, the current literature indicated that since the mid 1990's steara curing has been available which reportedly significantly reduces the time required for curling as compared to the use of hot water.

The CIPP liner is designed to provide structural capacity in addition to protection to the concrete liner from hydrogen sulfide related deterioration. Costs are associated with CIPP liner installation vary based on diameter and other actors, but can be expected to be in the range of $300 to $400 per lineal foot.

Sliplining

The SL process is one of the oldest and simplest forms of relining/restoration methods, having been performed for over 60 years. The SL process involves inserting a new smaller diameter pipe into the existing pipe; however, the reduction in pipe cross section is greater than that observed using a CIPP liner. In addition, the annular space between SL and the original pipe must be filled with grout. The SL pipe may be continuous or segmental depending on the type of liner pipe selected. Concrete, glass fiber reinforced polymer pipe, and some plastic pipe are examples of segmental liners. HDPE and PVC liners may be placed as continuous pipe by fusion welding the individual pipe sections together to create a single pipe.

In order to perform SL, an access shaft is required to insert the liner. The number of shafts required for insertion of a SL is a function of the bends that the liner is required to traverse.

Literature indicates that SL is applicable for use in pipe up to diameters ranging from 4 inches to 160 inches (13 feet, 4 inches). The published literature indicates that continuous SL's have a maximum diameter of approximately 60 inches. Larger diameter SL's can use glass fiber reinforced or reinforced concrete pipe up to 102 inches in diameter, and reinforced concrete pipe up to diameters ranging from 102 inches to 160 inches. The use of a larger diameter SL will likely require special permits to transport the materials.

The ability of SL to stop groundwater seepage is a function of the rate of seepage and the type of grout utilized to fill the annular space between the liner and the parent pipe. For running or gushing leaks, consideration should be given to sealing these leaks prior to inserting the SL. In order to reestablish connections with other sewer lines or laterals, the connections need to be excavated and exposed or located within a manhole structure. It should be noted that segmental slip lining with 9 feet inside diameter pipe was used on the Edison Corridor Interceptor near 15 Mile Road as a part of the 1980 sewer failure repair. Costs associated with SL vary based on diameter and other factors, but would typically be in the range of $500 per lineal foot.

Localized Repairs
Localized repairs can consist of modified versions of either CIPP or SL lining systems or may also consist of grouts or coatings. The reduction in pipe cross section, and therefore corresponding reduction in capacity, depends on the type of localized repair. Regardless of the thickness of the localized repairs on the hydraulics of a sewer is generally minimal because of the limited length in repair. Likewise, the localized repairs will only stop groundwater seepage at the point of the repair; CIPP and SL localized repairs may have to be supplemented with grouting to stop groundwater leakage. Grout may seal a current leak; however, after sealing one location, the leak may migrate to the next most susceptible area.

For small diameter pipe, grout is placed through the use of some form of a robot. For larger diameter pipe, the grout may be placed by man entry. In a large diameter sewer, workers create grout ports through a sewer liner and inject either a cement based or a chemical grout. The cement grout may consist of neat Portland Cement, micro-fine cement, a mixture of Portland Cement and a possolan such as fly ash, or in some cases a mixture of cement, water, and aggregate. Chemical grouts may consist of urethane based grouts that react with water to form foam, epoxy grouts that chemically bond to the sides of the crack, or acrylamide grout forms a waterproof gel.

The use of chemical grouts offers flexibility in placement not available from cement grouts. Chemical grouts may be used to seal running and gushing leaks several hundred feet from an access manhole. However, chemical grouts are not cost effective for filling large voids. If a large void is encountered, consideration should be given to the use of cement grouting. If cement grouting is not feasible, consideration should be given to the use of another form of localized repair.

Cement based grouts may be injected from the ground surface. However, the concern with surface injection is the potential for collapsing the sewer or tunnel at the point of injection. One method used to mitigate this potential is to place this grout by gravity only.

With respect to epoxy or other coatings, the experience to date in southeastern Michigan is somewhat mixed. The performance of a coating system is highly dependent on the preparation of the surface to which the coating will be bonded. Further, where the coatings do not cover the full circumference of the sewer, deterioration can occur behind the liner, ultimately causing the liner to peel and fail.

Panel Lining
Panel lining is considered a modified version of the sliplining process. The use of a panel lining system requires a sewer large enough for a man to enter, and the construction of a shaft of sufficient size to permit the lowering of the panels into the sewer. The sewer is lined by erecting individual panels to form a completed liner. The annular space between the panel and the original pipe is then grouted. Flows have to be sufficiently lowered in the sewer to permit the work. The panels can be lowered through a standard manhole, provided that there are no landings in place. Based on published literature reviewed on other successful panel lining projects, the partially installed segments remained in place when flow was restored. There are limited number of panel system providers in the United States. Published literature indicates

that this repair system has had limited use in the Chicago area. While there appears to be potential for this type of system, it does not appear to be viable at this time. The cost for panel lining is estimated to range from $100 to $200 per square foot.

Spiral Wound Pipe
Like panel lining, spiral winding is a modified version of sliplining. In this process, the sewer is lined with an interlocking PVC sheet. The annular space between the spiral winding and the PVC sheet is filled with a cementitious grout. The spiral winding process uses the energy from the flowing water in the sewer to join and expand the PVC or HDPE sheets. However, low flows are required while the liner is installed. The literature indicates that this type of liner is suitable for sewers ranging in diameter from 6 inches to 108 inches (9 feet). The published cost for spiral lining is approximately $13 per inch diameter per lineal foot.

Based on a review of the literature from several manufacturers, large diameter access shafts are not required to use this methodology. The installation for smaller diameter pipe may be limited to the existing manholes with the casting and cover removed. The existing sewer lines need to be cleaned prior to the installation of the spiral lining.

Cementitious Mortar Coating/ Shotcrete
Mortar lining is similar to the installation of the SewperCoat material currently being used on the Romeo Ann Interceptor repairs. The mortar, which contains both calcium aluminate cement and aggregate, is applied using shotcrete (pneumatically applied mortar or concrete) techniques. If flows are controlled, work could be performed from the invert, avoiding the need for work platforms. However, the work would have to be performed such that the material reaches a specified strength before flow is restored. Prior to the shotcrete placement, the surface of the existing concrete has to be prepared (cleaned) with high-pressure water. Discussions with the manufacturer indicate that the SewperCoat material must have a minimum of 6 hours of cure time from application to being exposed to flow. Any areas not protected with the SewperCoat should be cleaned with low-pressure water to remove any buildup that develops when the sewer is periodically opened up to pass stored flows. In the event that any oils are deposited on the surface after the initial cleaning, these areas will have to be recleaned using high-pressure water. With limited access, the cost for cemetitious lining is expected to range from $95 to $120 per square foot.

3.1.3 Proposed Rehabilitation

The following present a description of the specific rehabilitation proposed for the OMID. They have been grouped here by PCI number from South to North, PCI-5 through PIC-11.

PCI-5

A. Structurally rehabilitate the portion between Stephens Road and Ten Mile Road.

B. Provide a protective costing in the portion between Stephens Road and Ten Mile Road due to hydrogen sulfide issues in this area.

C. Grout the 9 running leaks identified.

PCI-6

A. Seal the numerous leaks in area of suspected void between Stations 19+42 and 33+75

B. Seal the numerous leaks in area of suspected void between Stations 35+00 and 40+00

C. Cement grout voids located at 25+25, 57+50, 71+50, 74+00, 103+50, 105+00, 110+90, 115+10 to 117+30, 123+30 to 125+90, and 128+80.

D. Power wash and install a protective coating at I-696 and Frazho Roads (Stations 56+00 to 47+00 and 32+00 to 19+00.

PCI-7

A. Seal 8 running leaks at Stations 134+41, 119+09, 108+19, 105+71, 95+23, 65+13, 26+33 and 15+45.

B. Rehab the existing liner and install a protective coating in the 1981 Repair Section Station 110+30 to 134+00.

C. Powerwash and install a protective coating from Station 104+00 to 110+30.

D. Seal all leaks and cement grout near Station 10+00.

PCI-8

A. Perform chemical grouting in those areas where multiple cracks were noted.

B. Seal the 22 running or gushing leaks with chemical gout

C. Rehab fractures at Stations 7+74, 13+94, 93+50 and between 95+56 and 95+97

D. Reline the outlet of sewage meter ST-S-2 [near Fifteen Mile and Dodge Park Roads]

E. Reline between Stations 31+00 and 14-02.

PCI-9

A. Rehab the hole observed at Station 76+83

B. Seal the one gushing and 9 running leaks with chemical grout

C. Perform chemical grouting in the areas of multiple cracking

PCI-10A

A. Seal running and gushing leaks with chemical grout

B. Rehab the areas at Stations 150+07 and 41+49 where scaling has exposed reinforcing steel

PCI-10B

A. Seal running and gushing leaks with chemical grout

B. Rehab sewer lining at Stations 208+51, 218+07 and 218+41 where scaling has exposed reinforcing steel

PCI-11A

A. Seal the 8 running and gushing leaks with chemical grout

B. Rehab the areas near Stations 137+34, 64+22, 63+20, 63+00 and 41+44 where the reinforcing steel is exposed and/or projecting.

C. Rehab the areas where there is missing aggregate near Stations 50+43 to 50+36 and 50+12 to 50+07

D. Rehab areas where there is projecting aggregate near 138+68, 132+17, 125+80 and 70+15 and between Stations 61+40 to 62+60, 59+54 to 59+72 and 50+12 to 50+31.

3.1.4 Project Maps

Figure 8 is an overall route map of the OMID. This map identifies the locations where major rehabilitation efforts will be performed. Detailed location information showing the types of problems being remedied as well as plan and profile drawings of the entire OMID are included as Appendix B.

3.1.5 Sensitive Features

As noted above, there may be minimal construction within floodplains, however sites will be returned to original conditions. There are no other sensitive features that will be affected during this process.

3.1.6 Mitigation of Environmental Impacts

The major short-term impacts from this project will be normal disturbances associated with any construction project. There may be short-term traffic disruptions, increased noise, and dust. Appropriate soil erosion and sedimentation control measures will be incorporated into the construction specifications as well as controls to minimize dust and noise impacts. Long-term environmental impacts are strictly positive in that the project will eliminate the potential catastrophic failure and discharge sewage into local waterways.

3.1.7 Schedule for Design and Construction

Table 3.1 below shows the approximate design and construction schedule. Figure 9 shows the approximate location of the construction staging areas.

It is currently anticipated that the rehabilitation be performed over four years [segments]. Design and construction will be carried out under an expected six contracts. These are indicated on the schedule provided in Table 3-2 below.

The segment one construction will be focused on installation of flow control gates which are required to restrict flow – allowing repair with minimal flow through the construction area – within PCI-5, PCI-6, PCI-7 and PCI-8. Still, even with gates in place the volume of total upstream storage will limit much of the rehabilitation efforts to less than 8 hour shifts – before personnel and equipment will need to be removed and flow resumed. The effort will consist of a complex coordination of flow control and construction activity. Additionally, the repairs to PCI-5, PCI-9, PCI-10a and PCI-10B will be started within the first segment. Three separate construction bid packages will be needed to cover these efforts. It is anticipated that these will be covered by FY 2010 loans.

The second segment will address the repairs in PCI-7. A single construction bid package will cover these efforts. It is anticipated that these will be covered by FY 2011 loans.

The third segment will address the repairs in PCI-8. A single construction bid package will cover these efforts. It is anticipated that these will be covered by FY 2012 loans.

The fourth segment will address the repairs in PCI-6, PCI-9 and PCI-11A. A single construction bid package will cover these efforts. It is anticipated that these will be covered by FY 2013 loans.

Table 3-2: OMID Rehabilitation Schedule

	Design Efforts:							Construction Efforts:												
	Bid	FY 2009			FY 2010				FY 2011				FY 2012				FY 2013			
Project Component	**Package**	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Hydraulic Study																				
Supplimental Geotech																				
Modify Corridor Gate	1																			
PCI-5/6 Access Structure	1																			
PCI-5 Rehab	1																			
PCI-6/7 New Gate/Access Structure	1																			
PCI-7/8 New Gate/Access/PS Structure	2																			
PCI-8 New Gate/Access Structure	2																			
PCI-9 Gate Structure	2																			
PCI-9 Temp fix of hole	3																			
PCI-10B Rehab	3																			
PCI-10A Rehab	3																			
PCI-7 Corridor Bypass	4																			
PCI-7 Rehab	4																			
PCI-8 Rehab	5																			
PCI-11A Rehab	6																			
PCI-6 Rehab	6																			
PCI-9 Rehab	6																			

3.1.8 Cost Summary

Based upon the expected construction efforts required to rehabilitate the OMI an estimate of probable cost has been prepared. The estimate is broken down by components generally following the original PCI contracts. For each of the components cost is further divided into Construction. Engineering, Construction Management, Legal and Administrative, and a Contingency has been provided.

All costs have been developed based on the likely rehabilitation method for work within the specific areas of the interceptor. And, it should be noted that a portion of the effort is associated with conducting a detailed hydraulic analysis to define the period of time flow can be restricted – allowing workers to enter the conduit. Following this analysis detailed design and construction of control gates to isolate flow upstream can begin. Design of specific rehabilitation methods will then take place followed by the construction efforts.

The total estimated project cost for rehabilitation of the Oakland-Macomb Interceptor is $144,601,347. Table 3-2 on page 3.11 provides a breakdown of this total.

It is anticipated that the construction will be performed in four segments corresponding with fiscal years 2010, 2011, 2012, and 2013.

Within segment one – FY 2010 – there are scheduled to be three bid packages whose total value [including construction, design, construction management, legal and administrative costs] is estimated to be $85,840,200.

Within segment two – FY 2011 – there is scheduled to be one bid package whose total value is estimated to be $26,923,565.

Within segment three – FY 2012 – there is scheduled to be one bid package whose total value is estimated to be $16,799,640.

Within the fourth segment – FY 2013 – there is scheduled to be one bid package whose total value is estimated to be $15,037,943.

3.2 AUTHORITY TO IMPLEMENT THE SELECTED ALTERNATIVE

A Chapter 21 [Inter-County] Drain Called the Oakland-Macomb Interceptor Drain Drainage District (OMIDDD) will be formed to take over ownership and operation of the OMID from DWSD. The district will encompass all communities in Oakland and Macomb Counties within the OMID service district. Figure 1 presents a map showing Macomb and Oakland Counties and the OMIDDD boundary.

3.3 USER COSTS

The annual cost for users within the OMIDDD have been calculated for each of the alternatives identified previously. It should be understood that these costs are only for the rehabilitation, operation and maintenance of the OMI. Additional costs will be imposed by the DWSD for treatment of the sewage and by the Clinton-Oakland Sewage Disposal District, the Macomb County Wastewater Disposal District and the local communities for collection and transport of sewage.

The costs are presented as annual cost per customer based on total OMIDDD population and an average household size of 2.61 people per household [SEMCOG value].

The No Action Alternative generates the lowest User Cost of only $2.61 per customer per year to cover operations and maintenance. There is no capitol component.

The Replacement Alternative generates the highest User Cost of $102.91 per customer per year. This includes $2.61 to cover operations and maintenance and $100.30 to amortize the construction costs.

The selected alternative – Rehabilitation of Interceptor – generates a User Cost of $31.68 per customer per year. This includes $2.61 to cover operations and maintenance and $29.07 to amortize the construction costs.

Appendix C – Monetary Evaluation – presents the derivation of these User Costs.

Table 3-3: OMID Rehabilitation Cost Estimate

Project Component	Fiscal Year	Bid Package No.	Construction	Engineering (6%)	Const Mgt (14%)	Legal – Admin (10%)	TOTAL	Bid Package Total	Fiscal Year Total
Hydraulic Study				$ 75,000		$ 7,500	$ 82,500		
Supplemental Geotech				$ 700,000		$ 70,000	$ 770,000	$ 852,500	
Modify Corridor Gate	FY 2010	One	$ 232,461	$ 13,948	$ 32,545	$ 27,895	$ 306,849		
PCI-5/6 Access Structure	FY 2010	One	$ 6,520,000	$ 391,200	$ 912,800	$ 782,400	$ 8,606,400		
PCI-5 Rehab	FY 2010	One	$ 29,092,072	$ 1,745,524	$ 4,072,890	$ 3,491,049	$ 38,401,535		
PCI-6/7 New Gate/Access Structure	FY 2010	One	$ 6,720,000	$ 403,200	$ 940,800	$ 806,400	$ 8,870,400	$ 56,185,184	
PCI-7/8 New Gate/Access/PS Structure	FY 2010	Two	$ 7,575,000	$ 454,500	$ 1,060,500	$ 909,000	$ 9,999,000		
PCI-8 New Gate/Access Structure	FY 2010	Two	$ 4,290,000	$ 257,400	$ 600,600	$ 514,800	$ 5,662,800		
PCI-9 Gate Structure	FY 2010	Two	$ 4,290,000	$ 257,400	$ 600,600	$ 514,800	$ 5,662,800	$ 21,324,600	
PCI-9 Temp fix of hole	FY 2010	Three	$ 71,500	$ 4,290	$ 10,010	$,580	$ 94,380		
PCI-10B Rehab	FY 2010	Three	$ 2,916,514	$ 174,991	$ 408,312	$ 349,982	$ 3,849,798		
PCI-10A Rehab	FY 2010	Three	$ 2,677,074	$ 160,624	$ 374,790	$ 321,249	$ 3,533,738	$ 7,477,916	$ 85,840,200
PCI-7 Corridor Bypass	FY 2011	Four	$ 19,212,600	$ 1,152,756	$ 2,689,764	$ 2,305,512	$ 25,360,632		
PCI-7 Rehab	FY 2011	Four	$ 1,184,040	$ 71,042	$ 165,766	$ 142,085	$ 1,562,933	$ 26,923,565	$ 26,923,565
PCI-8 Rehab	FY 2012	Five	$ 12,727,000	$ 763,620	$ 1,781,780	$ 1,527,240	$ 16,799,640	$ 16,799,640	$ 16,799,640
PCI-11A Rehab	FY 2013	Six	$ 2,208,921	$ 132,535	$ 309,249	$ 265,071	$ 2,915,776		
PCI-6 Rehab	FY 2013	Six	$ 7,373,080	$ 442,385	$ 1,032,231	$ 884,770	$ 9,732,466		
PCI-9 Rehab	FY 2013	Six	$ 1,810,380	$ 108,623	$ 253,453	$ 217,246	$ 2,389,702	$ 15,037,943	$ 15,037,943
TOTALS			**$ 108,900,642**	**$ 7,309,039**	**$ 15,246,090**	**$ 13,145,577**	**$ 144,601,347**	**$ 144,601,347**	**$ 144,601,347**

4.0 Environmental Impacts

4.1 DESCRIPTION OF THE IMPACTS

4.1.1 Beneficial and Adverse Impacts

This project has many beneficial impacts, including, but not limited to, protecting basements from potential sewage back-up if the sewer collapses; protecting water quality from potential overflow if a sewer collapses; reducing ground water infiltration which reduces treatment requirements; job production; and increased quality of life and assurance residents will have that sewage transportation will not be a problem.

Adverse impacts could include minor construction related disruptions and disturbance to local recreational park areas.

4.1.2 Short-Term and Long-Term Impacts

Short term impacts include construction related disruptions, including dust, traffic, sedimentation, air quality and noise. Additional short-term impacts include disruption of e recreational parking areas, and increased sedimentation in catch basins.

The long term benefit of having a stable sanitary sewer transportation mechanism outweighs the minimal short-term inconveniences and environmental disturbances. If this project is not completed it has been determined catastrophic failure will occur in the next 10-years which would cause raw sewage to enter buildings and local waterways.

4.1.3 Irreversible or Irretrievable Resources

A Chapter 21 [Inter-County] Drain Called the Oakland-Macomb Interceptor Drain Drainage District (OMIDDD) will be formed to take over ownership and operation of the OMID from DWSD. This commitment would potentially be irreversible and would allocate costs associated with maintenance to this specific district.

There are no irretrievable resources being used for this project.

4.2 ANALYSIS OF THE IMPACTS

4.2.1 Direct Impacts

Direct impacts are impacts that are directly attributable to the construction and operation of the project. Direct impacts of this project include potential short-term impacts due to increased noise and dust during construction and possible traffic disruptions during material transporting. Minor disturbances to recreational parking areas are also anticipated. Long-term environmental impacts are strictly positive in that the project will eliminate the potential discharge of raw sewage into basements and local waterways. All disturbed areas will be returned to original state or better.

4.2.2 Indirect Impacts

Indirect impacts are impacts caused by the project that are removed in time and/or distance from the immediate construction activities. Examples include, but are not limited to, changes in development, changes in land use, changes in air/water quality, impacts on local resources and aesthetics, and impacts on farmland. Indirect impacts from construction could potentially be additional sedimentation from truck traffic in local catch basins, and aesthetically disturbed areas until full rehabilitation. Positive indirect impacts include protection of local waterways and knowledge by residents of a well maintained sewer system.

4.2.3 Cumulative Impacts

Cumulative impacts are those impacts to the environment that increase in magnitude over time or that result from individually minor but collectively significant actions taking place over time. There are no known projects in the Project site area that would contribute to either short-term or long-term impacts associated with this project. If there were to be additional construction projects occurring within the project area during construction of this project, then the potential noise, dust, and traffic disruption problems might be intensified. As with this project, it is assumed that any other projects will be required to minimize any local traffic disruptions, minimize dust generation and provide positive mitigation controls for fugitive dust generation, provide adequate soil erosion and sedimentation measures as dictated by the county regulations, and restore any disturbed areas at the completion of construction.

5.0 Mitigation

5.1 GENERAL

As noted above, adverse impacts could include minor construction related disruptions and disturbance to local recreational park areas. Construction related mitigation will be addressed in Section 5.2 below. Right-of-ways along recreational parking areas will be disturbed for portions of this project as entry points into the sewer. These areas will be in locations that do not affect organized sports and minimally affect non-motorized activities. Once construction is complete, disturbed areas will be mitigated back to original or better condition. Within a growing season or two the disturbed areas should not be visible.

5.2 SHORT-TERM CONSTRUCTION-RELATED MITIGATION

Construction related impacts are noted above and can be mitigated through the construction specifications and inspections to ensure that:

- All construction vehicles are in good operating condition.
- Proper dust suppression measures are taken.
- Appropriate soil erosion and sedimentation measures are implemented including a Certified Construction Site Storm Water Operator being hired to oversee the soil erosion activities.
- Direct material transport along routes that will minimize traffic disruptions.

5.3 MITIGATION OF LONG-TERM IMPACTS

No alternative routes are required and there are no long-term adverse impacts that require mitigation.

5.3.1 General Construction

Appropriate BMPs will be installed to insure minimal impacts to local waterways. All appropriate permits will be obtained before construction begins.

5.3.2 Siting Decisions

Siting decisions are not applicable as this is rehabilitating an existing sewer.

5.3.3 Operational Impacts

Operational impacts are minimal and would occur during maintenance requirements. As this system is currently operational the residents would not perceive any differences in the surrounding environment after short-term impact mitigation was complete.

5.4 MITIGATION OF INDIRECT IMPACTS

Indirect impacts from construction could potentially be additional sedimentation from truck traffic in local catch basins, and aesthetically disturbed areas until full rehabilitation. This is mitigated through street sweeping, catch basin cleaning and seeding during appropriate seasons.

Positive indirect impacts include protection of local waterways and knowledge by residents of a well maintained sewer system. This will be fully disclosed through public meeting(s) before the project start and information regarding the project during and after project completion.

6.0 Public Participation

Based on State and Federal regulations, the public shall have a minimum of 30 days to participate and comment on the project and proposed and recommended alternatives. This was fulfilled by advertising the opportunity to review this project plan and participate in a formal public hearing through the Macomb Daily and Oakland Press local newspapers. The project plan and public notice was also posted on the Macomb and Oakland County's websites, and an electronic and hard copy of the project plan and public notice was also forwarded to SEMCOG and the 24 municipal offices within the project boundary. A draft project plan was also forward to the MDEQ for review and comment.

6.1 PUBLIC MEETINGS ON PROJECT ALTERNATIVES

There was one formal public hearing held regarding this project plan.

6.2 THE FORMAL PUBLIC HEARING

A formal public hearing was held on Wednesday, June 10, 2009 at the Utica Schools Instructional Resource Center (14201 Canal Rd, Sterling Heights, Michigan 48313) at 6:30 p.m. Nine attendees and one presenter were in attendance. A sign-in sheet is available in Appendix E–3.

6.2.1 Public Hearing Advertisement

A Notice of Public Hearing was posted in the Macomb Daily and Oakland Press on Thursday, May 10, 2009. This Notice was also posted on Macomb and Oakland County's websites and forwarded, along with a hard and electronic copy of the draft project plan, to the local communities. A copy of this public notice is available in Appendix E–3.

6.2.2 Public Hearing Transcript

A court reporter was hired for this public hearing from Meadowbrook Court Reporting. A set of complete transcripts is available in Appendix E–3.

6.2.3 Public Hearing Contents

The public hearing presentation was given by John Bona of Environmental Consulting & Technology, Inc. The presentation was a power point reviewing the overall project, service area, history of interceptor, distress areas, alternatives solutions, social and environmental impacts, potential costs and construction schedule. The presentation is available for review in Appendix E- 3.

6.2.4 Comments Received and Answered

One set of comments were received from the MDEQ on May 12, 2009. Doug Buchholz, OCWRC, Mike McMahon, OCWRC, Phil Sanzica OCWRC, Jim Pistilli, MCPWC, Fritz Klinger, NTH, Harry Price, NTH, and John Bona, ECT, meet with the MDEQ on June 10, 2009 to discuss this project further. Based on these discussions a response letter was sent to the MDEQ on June

25, 2009 to further clarify project details, and appropriate modifications to the final plan were made.

No other written comments/questions were received during the public comment period.

6.3 ADOPTION OF THE PROJECT PLAN

The Macomb County Public Commissioner, Anthony V. Marrocco, by authority of the Board of Supervisors, has approved a resolution of adopting a final project plan for wastewater system improvements for the Oakland-Macomb Interceptor Rehabilitation Project.

The Oakland County Water Resources Commissioner, John P. McCulloch, by the authority of the Board of Commissioners, has approved a resolution of adopting a final project plan for wastewater system improvements for the Oakland-Macomb Interceptor Rehabilitation Project.

These signed resolutions are available for review in Appendix E – Section 4 of this project plan.