

Westlake Interceptor Repair Savings Prove Long-Term Success

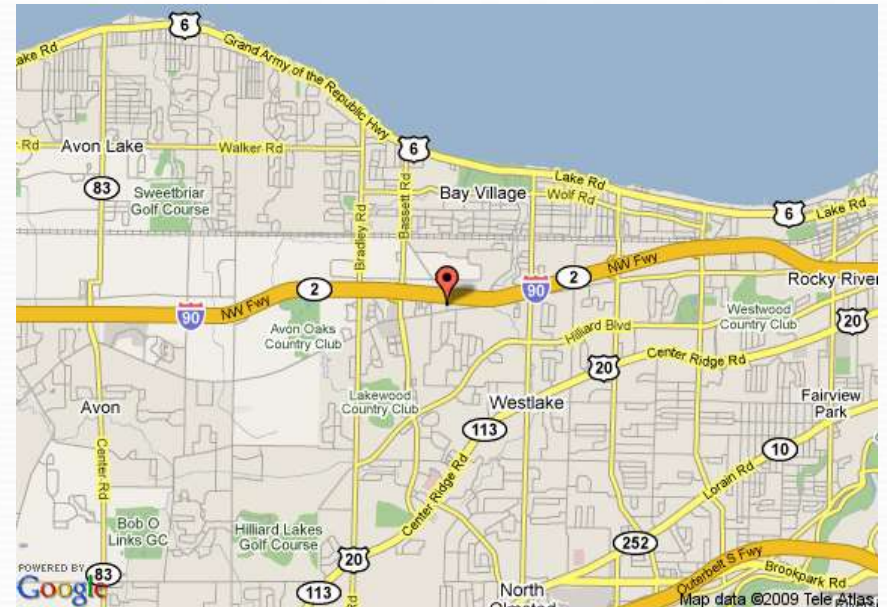
Presented by:

Brad Boyer
Watermark Engineered Product Sales, Inc.



CITY OF WESTLAKE

- FOUNDED IN 1811
- POPULATION-35,000
- 16 SQUARE MILES
- 124 MILES OF STORM
- 142 MILES OF SANITARY
- ENGINEERING DEPT.
 - DESIGN
 - CONTRACT ADMIN.
 - INSPECTION



INTRODUCTION

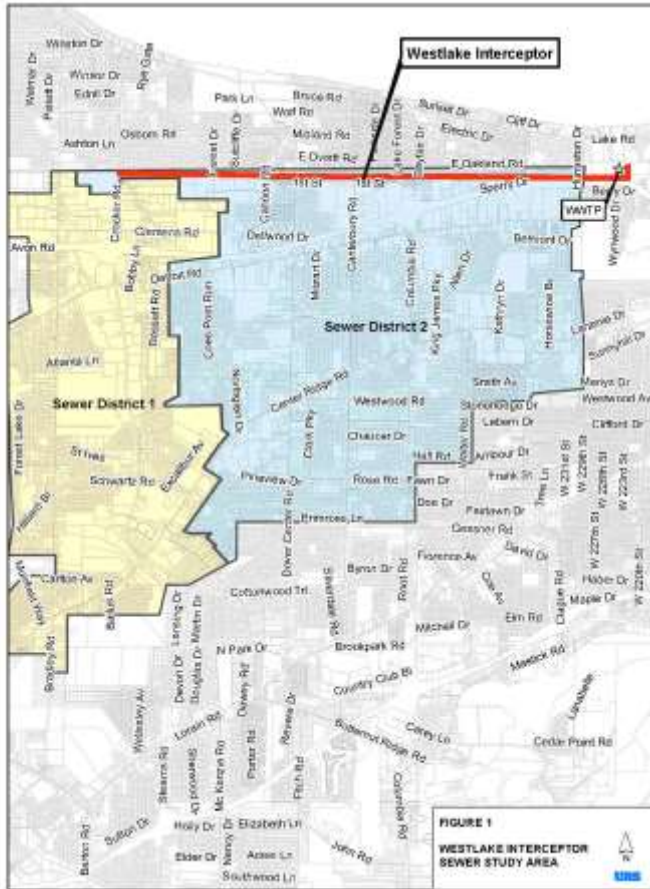
- NEIGHBORING CITY HAD AN INTERCEPTOR SEWER COLLAPSE
- "RCP" PIPE WAS ONLY 18 YEARS OLD
- FLOODED OVER 40 HOMES
- SETTLED LAWSUITS HAVE EXCEEDED \$560k
- THIS PROMPTED WESTLAKE TO INVESTIGATE THE CONDITIONS OF OUR INTERCEPTOR



WORST CASE SCENARIOS



PROJECT LIMITS



- THE INTERCEPTOR IS LOCATED ALONG THE NORTHERN LIMITS OF THE CITY
- 23,700 FEET LONG INTERCEPTOR
- PIPE SIZE RANGES FROM 36" TO 60" IN DIAMETER
- 63 MANHOLES ARE ALONG THE INTERCEPTOR
- ADWF – 6 MGD

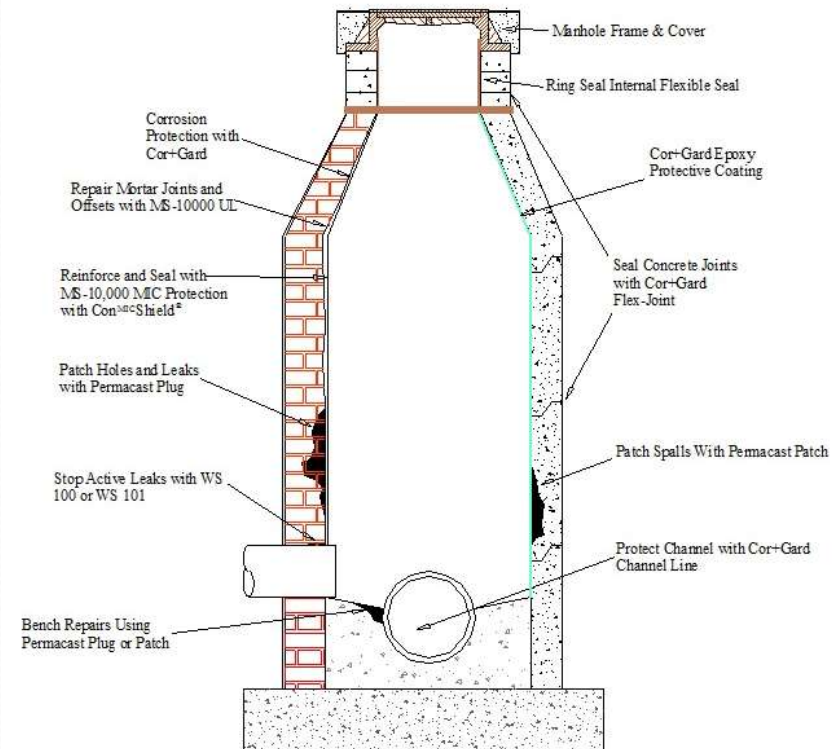
CONDITION ASSESSMENT



- URS CORPORATION, CLEVELAND, OH
 - EMERGENCY RESPONSE PLAN
 - CONDITION ASSESSMENT
 - CCTV INSPECTION OF THE INTERCEPTOR
 - MANHOLE INSPECTION
- WORK WAS CONDUCTED IN 2007, REPORT SUBMITTED IN 2008
- BUILT IN THE 60'S WITH NO ASSESSMENT CONDUCTED BEFORE

INVESTIGATION-MANHOLE

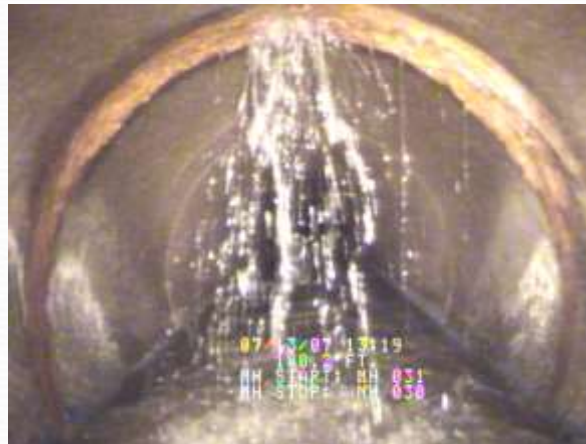
- STRUCTURAL INTEGRITY
 - DEFECTS
 - CORROSION
- INFILTRATION
- GENERAL AS-BUILT INFO
 - GRADE RING AREA
 - CASTING
 - STEPS



MANHOLE RENEWAL

MAINLINE INSPECTION

- OPERATIONAL AND MAINTENANCE ISSUES
 - LEAKING JOINTS (I/I)
 - CAPACITY REDUCING OBSTRUCTIONS
 - DEBRIS IN PIPE
- STRUCTURAL DEFECTS
 - CRACKS & FRACTURES
 - CORROSION (MIC)
 - OPEN JOINTS



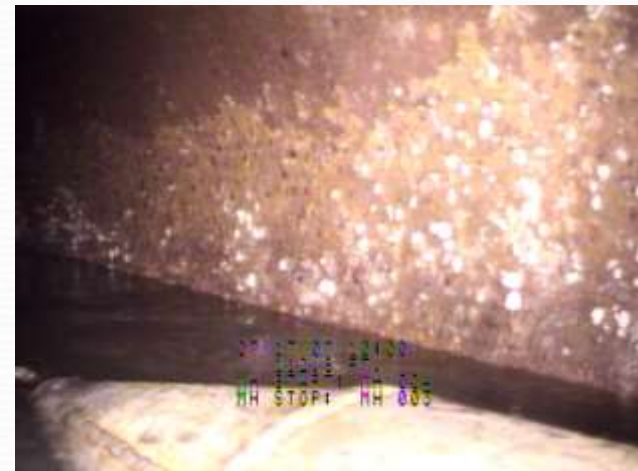
HYDROGEN SULFIDE CORROSION

- BACTERIAL GROWTH OCCURS ON RCP WITH A $\text{pH} < 7$
 - CARBON DIOXIDE
 - HYDROGEN SULFIDE
- 17 pH SWAPS TAKEN – MH INSPECTION
 - 15 SITES – pH OF 5
 - 2 SITES – pH OF 2



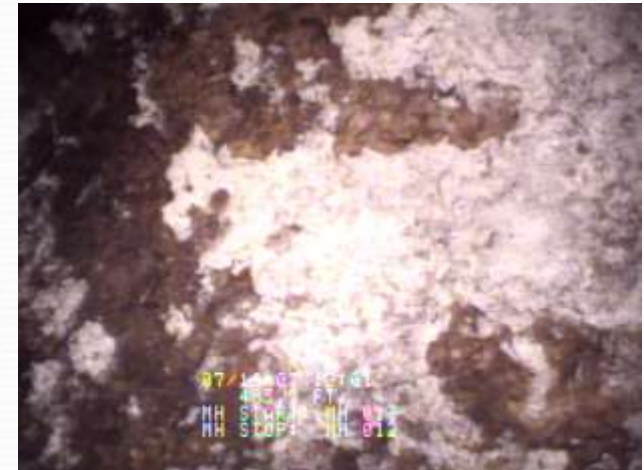
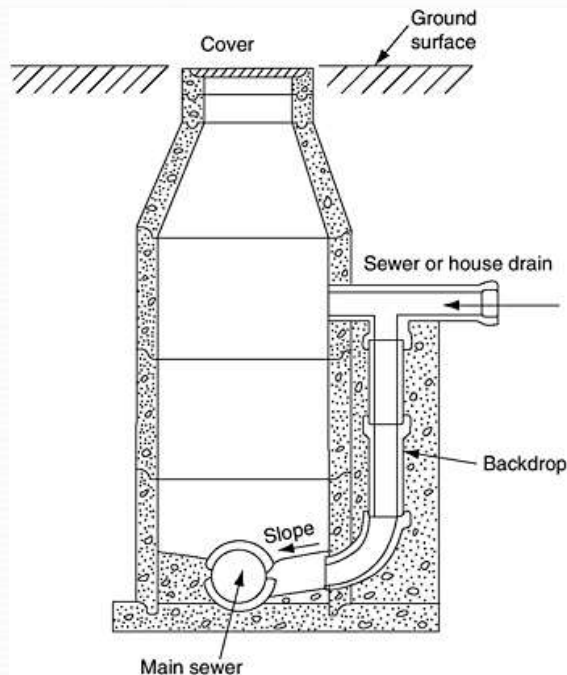
MAINLINE FINDINGS

- HYDROGEN SULFIDE CORROSION WAS SEEN IN THE FIRST 7 MANHOLE RUNS FROM THE TREATMENT PLANT.
 - GRADE CHANGES
 - 90 DEGREE BEND
 - PROXIMITY TO PLANT



MAINLINE FINDINGS

- HYDROGEN SULFIDE CORROSION WAS SEEN AT ALL MAJOR TRUNK LINES (6) DUE TO DROP MANHOLES
 - 50' +/- MANHOLE
 - REMAINDER GOOD CONDITION

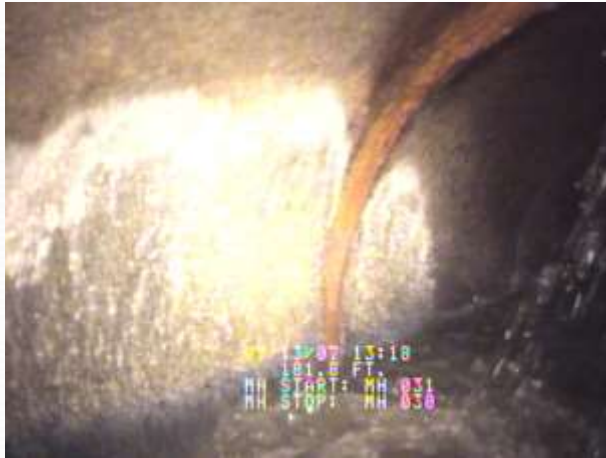


CLAGUE ROAD



COLUMBIA ROAD

MAINLINE FINDINGS



CANTERBURY ROAD



DOVER CENTER ROAD



CAHOON ROAD



CROCKER ROAD

MANHOLE FINDINGS

- THE MAJORITY OF THE MANHOLES HAD INFILTRATION.
- LARGE MINERAL DEPOSITS EXISTED AT SOME MANHOLES FROM INFILTRATION.
- HYDROGEN SULFIDE CORROSION OCCURED AT DROP MANHOLES.



MANHOLE FINDINGS



REHABILITATION DESIGN

- CITY PERFORMED THE DESIGN
 - TRADE SHOWS & CONFERENCES
 - DISCUSSIONS WITH CONTRACTORS
- PERMANENT REPAIR TO CORRODED PIPE
- PREVENT FUTURE CORROSION
- PERIODIC CHEMICAL TREATMENTS NOT CONSIDERED FOR HYDROGEN SULFIDE CONTROL
- TARGET AREAS OF REHABILITATION – NOT ENTIRE PIPE LENGTH, WHICH WERE 550'

CIPP OPTION

- CURED IN PLACE PIPE WAS FIRST THOUGHT OF AS A REHABILITATION OPTION.
- PARTIAL LINERS FOR THIS DIAMETER PIPE NOT FEASIBLE. ONLY LINE MH TO MH.
- CIPP OTHER COSTLY DRAWBACKS
 - MANHOLE CONE REMOVAL
 - PIPE HAD SIZE REDUCTIONS



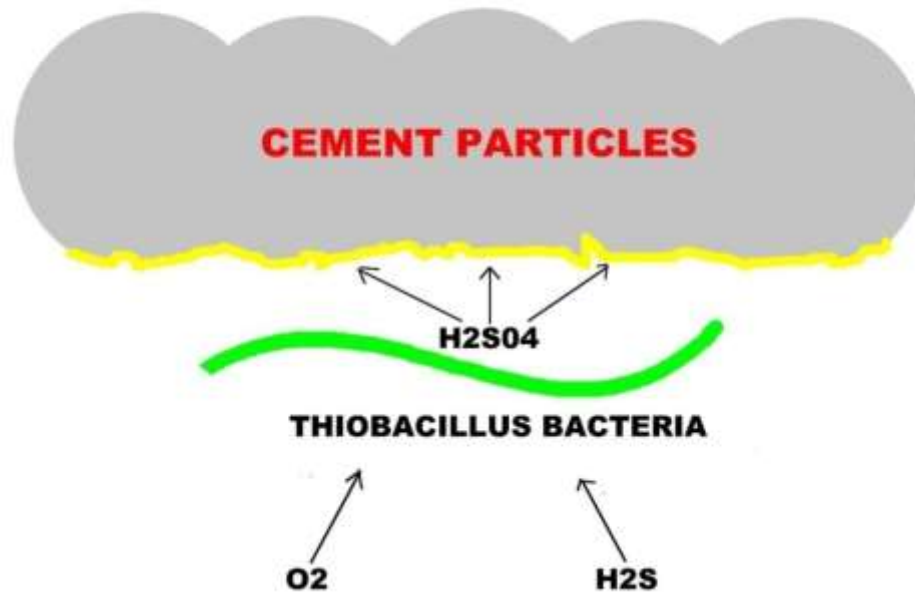
CCCCP

- CENTRIFUGALLY CAST CONCRETE COATING IS APPLIED WITH A ROTATING SPIN CAST NOZZLE
- USED VERTICALLY →
HORIZONTAL
- ANTIMICROBIAL ADDITIVE IS DOSED INTO THE MIX TO RENDER THE COATING UNINHABITABLE FOR BACTERIA GROWTH, WHICH STOPS THE CORROSION.
 - ConShield® from CONSHIELD TECHNOLOGIES
 - INCORPORATED IN THE MIX

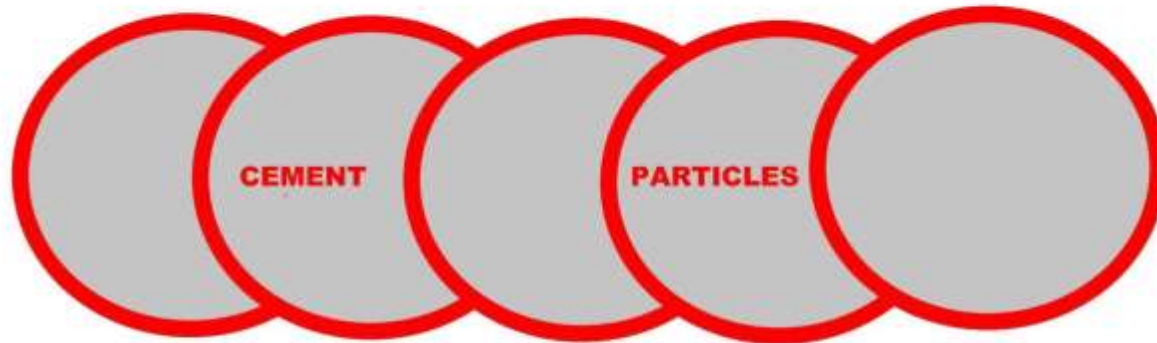


CCCCP

UNPROTECTED CONCRETE



PROTECTED WITH CONSHIELD



NO BACTERIA TO CONVERT GAS TO ACID

↑
O₂

↑
H₂S

REHABILITATION PROJECT

- 2009-2010
- 1.6 MILLION DOLLARS
- UNITED SURVEY INC. OF CLEVELAND, OHIO



REHABILITATION PROJECT

- CLEANING
- REHABILITATION
 - CCCP
 - CIPP (TRUNK LINES)
- MANHOLE REHABILITATION



BY-PASS - Pumping

- REHABILITATION OCCURRED UNDER FULL BY-PASS
- 12 MGD CAPACITY
- RAIN EVENT COULD CAUSE THE FLOW RATE TO INCREASE 5 FOLD
- PUMP WATCHMAN
- VARIOUS SET-UPS WERE REQUIRED AT EACH TRUNK LINE



CCCP PREP WORK

- ORGANIC MATTER AND DETERIORATED PIPE WERE CLEANED
 - HIGH PRESSURE WATER
 - HIGH PRESSURE AIR
 - ACTIVE LEAKS SEALED
 - CONSHIELD RINSE APPLIED TO KILL ANY ACTIVE BACTERIA



CCCP REHABILITATION

- TWO MOBILE BATCH PLANTS USED
- SPIN CAST MIX
 - PERMACAST PL-8000 – DRY MIX
 - CONSHIELD
 - WATER
 - AP/M PERMAFORM



CCCP REHABILITATION

- SPIN CASTER
 - AIR LINE
 - PRODUCT LINE
- OPERATOR AT SPIN CASTER TO CONTROL APPLICATION RATE
- WINCH OPERATOR NEAR MANHOLE TO CONTROL RETRIVAL SPEED OF SPIN CASTER
- ID / CURING COAT APPLIED LATER



CCCCP TEST RESULTS

- COMPRESSIVE STRENGTH TESTING
- ASTM C 109
- FLOW WAS RESUMED UNDER 24 HOURS WITH A MINIMUM 2,300 PSI BREAK

	1 DAY	2 DAY	3 DAY	28 DAY
AVG. BREAK (PSI)	3,160	4,865	6,246	8,037



CCCP REHABILITATION



2010 COST SAVINGS

SIZE OF PIPE	DISTANCE FT (CCCP)	DISTANCE FT (CIPP)		CCCP UNIT \$	CIPP UNIT \$	CCCP COST	CIPP COST
60"	562	2,119		\$280.00	\$420.00	\$157,360.00	\$889,980.00
60"	102	105		\$214.00	\$420.00	\$21,828.00	\$44,100.00
48"	75	952		\$258.00	\$336.00	\$19,350.00	\$319,872.00
42"	2,821	2,853		\$173.00	\$294.00	\$488,033.00	\$838,782.00
36"	401	1,184		\$241.00	\$252.00	\$96,641.00	\$298,368.00
TOTALS	3,961	7,213				\$783,212.00	\$2,391,102.00
TOTAL SAVINGS							\$1,607,890.00

POST INSPECTION

- VARIOUS PORTIONS OF THE INTERCEPTOR WERE FILMED THIS YEAR



CONCLUSION

- TARGET REHABILITATION APPROACH SAVES MONEY
- CCCP ANOTHER TOOL FOR REHABILITATION
- COMPREHENSIVE ASSESSMENT WAS KEY TO SUCCESSFUL PROJECT
- COMMUNICATION VITAL IN THE INDUSTRY WITH EXCHANGE OF KNOWLEDGE



THE END!

