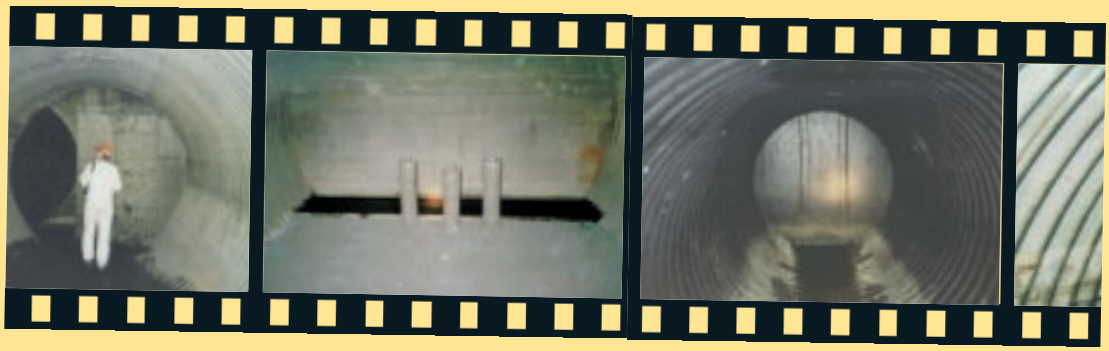
National
Corrugated Steel Pipe
Association

Condition Survey of Corrugated Steel Pipe Detention Systems

An Interim Report
March, 1999

.DETENTION.SYSTEMS.



National Corrugated Steel Pipe Association (NCSPA), in cooperation with the **American Iron and Steel Institute** (AISI), undertook this study to evaluate the condition of CSP stormwater management detention structures in the Washington, D.C. metro area. All inspections were performed by **Parsons Brinkerhoff** located in Baltimore, Maryland.

CSP detention structures have been in use in this area since as far back as the early 1970's. The objective was to perform a qualitative condition survey to assess the overall performance of these systems. This Interim Report contains the findings from the initial inspections. A Final Report will be issued when additional inspections have been completed.

SITE SELECTION

All sites identified and inspected in Montgomery County, Maryland; Fairfax City, Virginia; and Alexandria, Virginia, were determined and located by the government official. In most cases, this was an Inspector, which eliminated any potential bias in site selection. The Inspector was told to supply the oldest structures in place and also to include various coatings (Galvanized, Aluminized, and Bituminous Coated).

Of the twenty-one sites inspected, eleven were galvanized coated; three were aluminized coated type 2; three were fully bituminous coated; and three were aluminum. One of the galvanized sites had saw cuts in the invert to promote infiltration of the runoff into the ground in a similar manner as perforated CSP. Three sites contained sand filters for water quality purposes.

PROCEDURES

The inspection procedures consisted of a qualitative survey of pipe conditions. This included identifying the coating type, corrugation profile, general dimensions of the system, type of release structure, lockseam condition, joint condition, coating condition for the top, sides, and invert, land use, and any other items of interest.

The firm of Parsons Brinkerhoff was contracted to perform the inspections using a Professional Engineer, Dan O'Leary. In addition, a safety consultant was employed to oversee all confined space issues

The coating condition was evaluated on a visual rating scale shown below in Table 1. This same criteria was used in a condition survey of CSP performed by Corrpro Companies in 1986. Environmental conditions (pH, resistivity) were outside the scope of this study.

Table 1: Visual Rating Scale

Rating	Description
100 – 95	
90	Galvanizing Intact
80 – 85	
75	Galvanizing Partly Gone, Some Rust
60 – 55	
50	Galvanizing Gone, Significant Metal Loss
45 – 40	
35 – 30	
25	Deep Pits, Heavy Metal Loss, Perforation
20 – 15	
10 – 5	
0	Major Metal Loss

FINDINGS

The condition survey findings are illustrated in the tables at right, and in the detailed site conditions that follow. Overall, the systems were found to be performing extremely well. From a durability standpoint, most systems still had all zinc intact after up to twenty five years. Only one site showed any signs of metal loss.

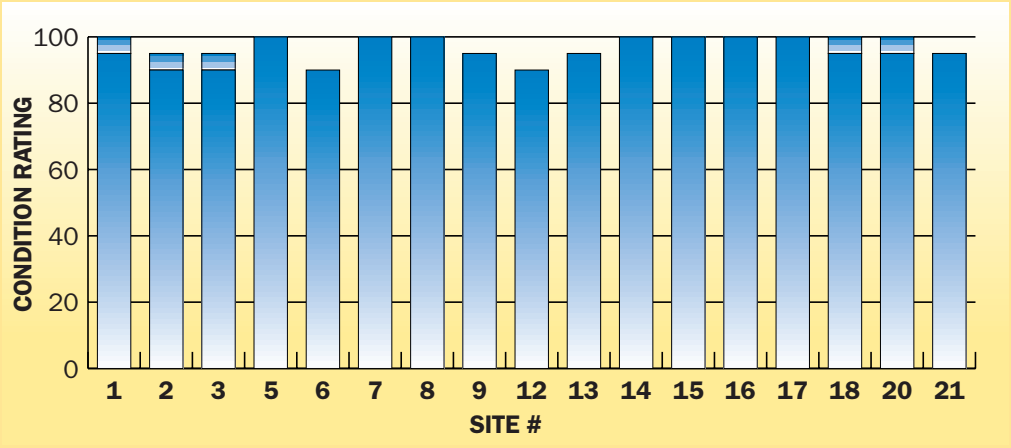
There were no signs of visible deflection in the pipes with the exception of mechanical damage during installation at one location. This damage was not significant enough to require any maintenance activity. Most joints were believed to be soil tight with one exception.

PRELIMINARY CONCLUSIONS

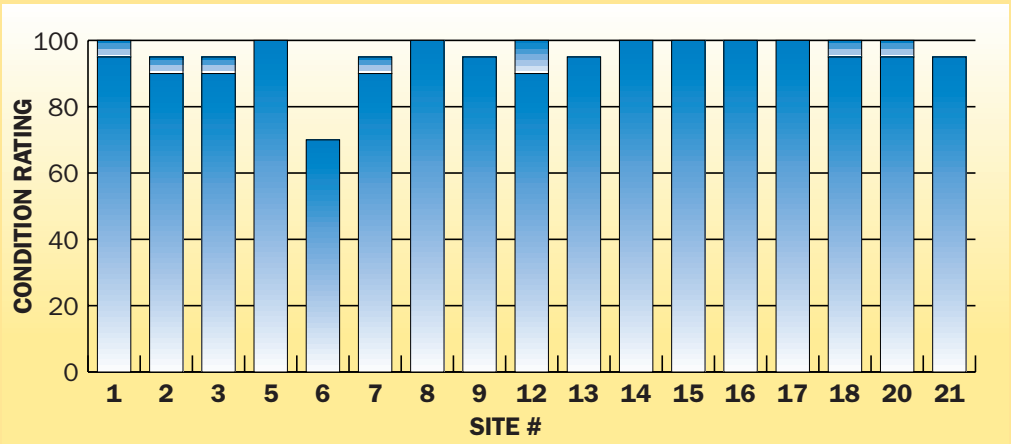
The results of the condition survey indicate that CSP systems provide a reliable and durable solution for stormwater detention. Based on the observations on the older systems (25 years), it would be reasonable to expect these systems to continue service for two to four times (or longer) without any repair being necessary. In addition, a study performed by Corrpro Companies in 1986 found that, "93.2% of plain galvanized CSP installations have a soil-side service life in excess of 75 years, while 81.5% have a soil-side service life in excess of 100 years." The Corrpro finding is consistent with this investigation.

. CONDITION . RATINGS - - ALL . SITES .

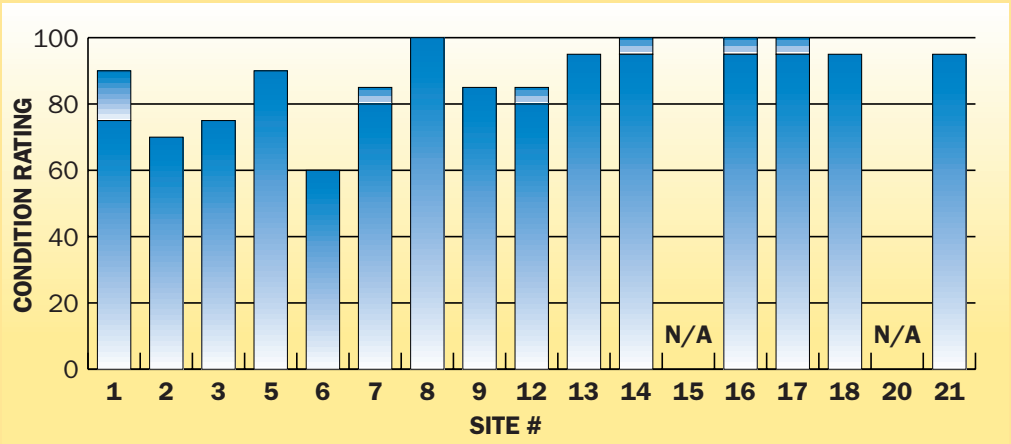
Top



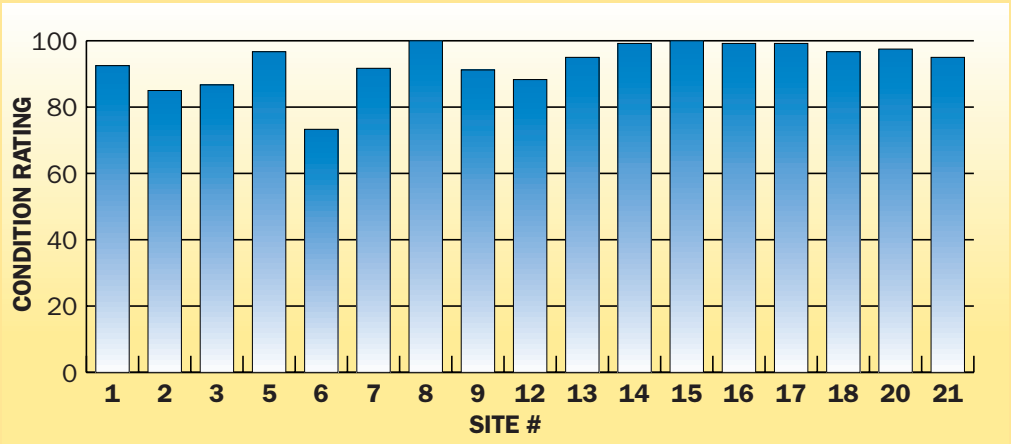
Sides



Invert

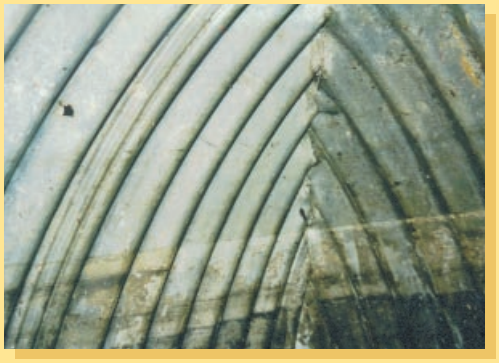


Average Rating



. CONTENTS .

Sites 4, 10, 11, and 19 were aluminum structures which were not intended for study and were not evaluated.



Condition Rating

Top 95/100

Sides 95/100

Invert.....75/90*

Avg. Rating.....**92.5**

Age: 25 years

Coating Type: Galvanized

Diameter: 60"

Corrugation: 1x3" Helical

Land Use: Industrial

Location: Montgomery County, Maryland

Comments:

*18" standing water; could not see invert; rating based on probing.

Detention System

.SITE.2.

Condition Rating:

Top 90/95

Sides 90/95

Invert.....70*

Avg. Rating.....**85**

Age: 25 years

Coating Type: Galvanized

Diameter: 48"

Corrugation: 1x5" Helical

Land Use: Industrial

Location: Montgomery County, Maryland

Comments:

*Isolated pitting invert.

Condition Rating:

Top 90/95

Sides 90/95

Invert 75

Avg. Rating.....**86.7**

Age: 25 years

Coating Type: Galvanized

Diameter: 48"

Corrugation: 1x5" Helical

Land Use: Industrial

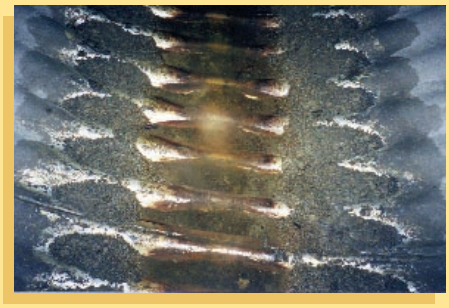
Location: Montgomery County, Maryland

Comments:

36" saw-cuts in every corrugation to promote infiltration;

stone backfill.

.SITE.5.



Condition Rating:

Top 100

Sides 100

Invert 90

Avg. Rating.....**96.7**

Age: 20 years

Coating Type: Galvanized

Diameter: 60"

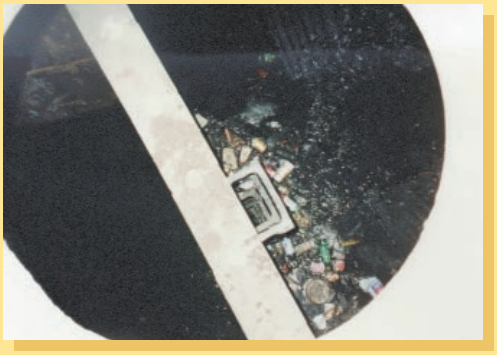
Corrugation: 1x5" Helical

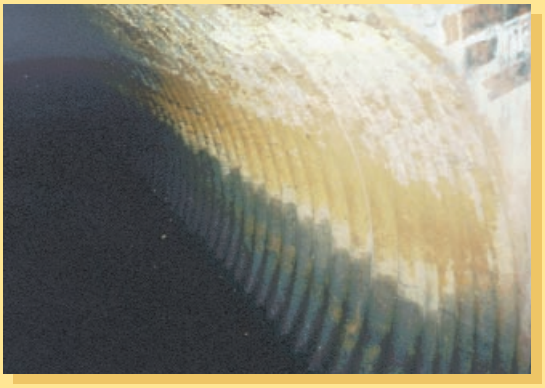
Land Use: Industrial

Location: Montgomery County, Maryland

Comments:

Oil grit separator at entrance.





Condition Rating:

Top 90
Sides 70
Invert 60
Avg. Rating.....**73.3**

Age: 20 years
Coating Type: Galvanized
Diameter: 96"
Corrugation: 1x5" Helical
Land Use: Commercial
Location: Montgomery County, Maryland

Comments:

6" low orifice clogged; 24" standing water.

Red rust on sides with coating loss.

SITE 6.

.SITE.7.

Condition Rating

Top 100

Sides 90/95

Invert 80/85

Avg. Rating.....**91.7**

Age: 20 years

Coating Type: Galvanized

Diameter: 96"

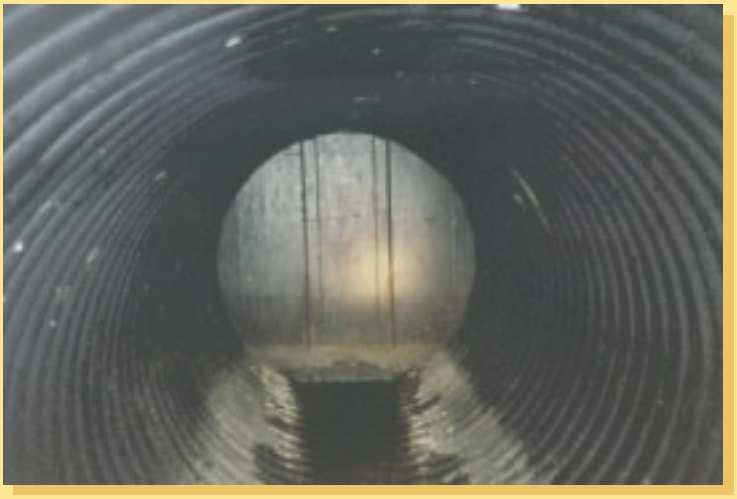
Corrugation: 1x5" Helical

Land Use: Commercial

Location: Montgomery County, Maryland

Comments:

Limited staining in invert.



Condition Rating

Top 100

Sides 100

Invert 100

Avg. Rating.....**100**

Age: 20 years

Coating Type: Fully Bituminous Coated

Diameter: 72"

Corrugation: 1x5" Helical

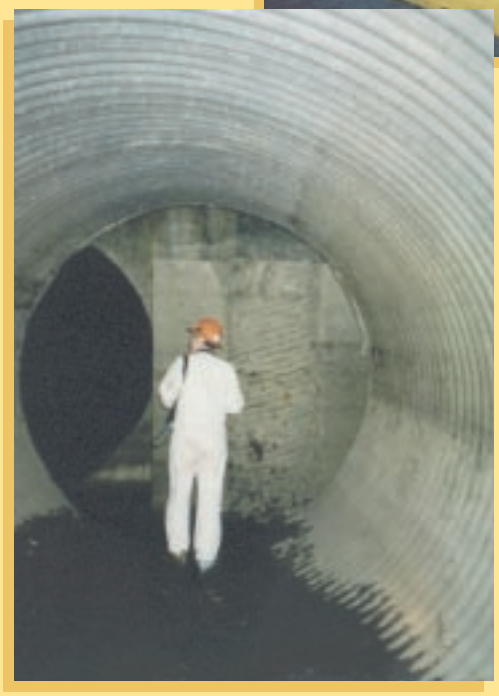
Land Use: Commercial

Location: Montgomery County, Maryland

Comments:

Bituminous coating intact; no rust on exposed galvanized surface.

.SITE.9.



Condition Rating

Top 95

Sides 95

Invert 85

Avg. Rating.....**91.2**

Age: 20 years

Coating Type: Galvanized

Diameter: 108"

Corrugation: 1x5" Helical

Land Use: Commercial

Location: Montgomery County, Maryland

Comments:

Oil grit separator at entrance; minor soil trough joints; no sign of gaskets with joints.

Condition Rating

Top 90

Sides 90/100

Invert 80/85

Avg. Rating.....**88.3**

Age: 14 years

Coating Type: Aluminum Coated Type 2

Diameter: 48"

Corrugation: ½" x 2⅔" Helical

Land Use: Commercial

Location: Montgomery County, Maryland

Comments:

.SITE.13.

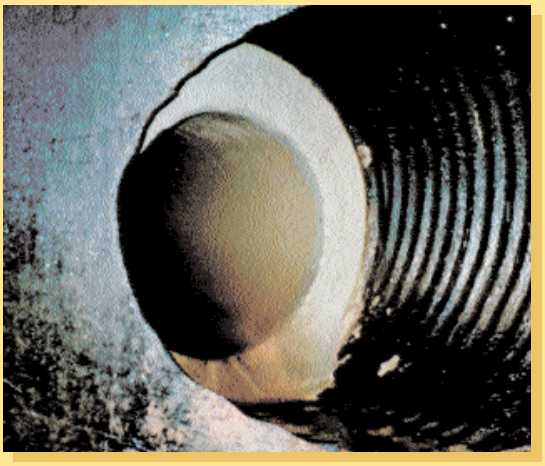
Condition Rating

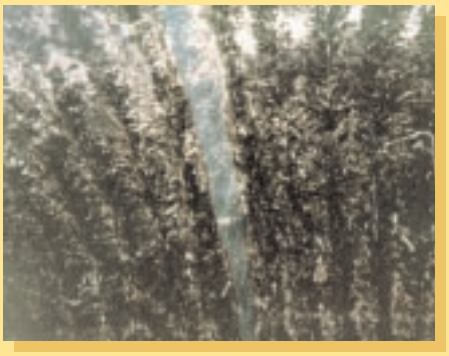
Top	95
Sides	95
Invert	95
Avg. Rating	**95**

Age: 10 years
Coating Type: Aluminum Coated Type 2
Diameter: 108"
Corrugation: 1x5" Helical
Land Use: Commercial
Location: Montgomery County, Maryland

Comments:

Oil grit separator at entrance.





Condition Rating

Top 100

Sides 100

Invert 95/100

Avg. Rating.....**99.2**

Age: 5 years

Coating Type: Fully Bituminous Coated

Diameter: 67"x104"

Corrugation: 1x5" Helical

Land Use: Residential

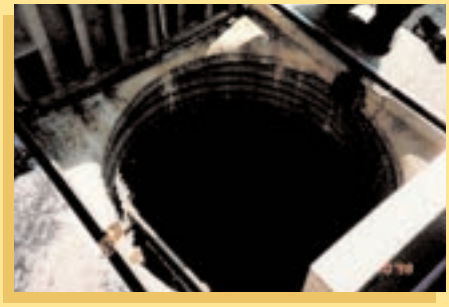
Location: Fairfax City, Virginia

Comments:

Asphalt coating removed in sections of invert.

No signs of rust on exposed galvanizing.

Sand Filter System



Condition Rating

Top 100

Sides 100

Invert .....N/A

Avg. Rating.....**100**

Age: Less than 3 years

Coating Type: Galvanized with Painted Coating

Diameter: 120"

Corrugation: 1x5" Helical

Land Use: Residential

Location: Fairfax City, Virginia

Comments:

Well drained; no signs of sediment clogging.

Condition Rating

Top 100

Sides 100

Invert 95/100

Avg. Rating.....**99.2**

Age: Minimum 10 years

Coating Type: Aluminum Coated Type 2

Diameter: 80"

Corrugation: 1x5" Helical

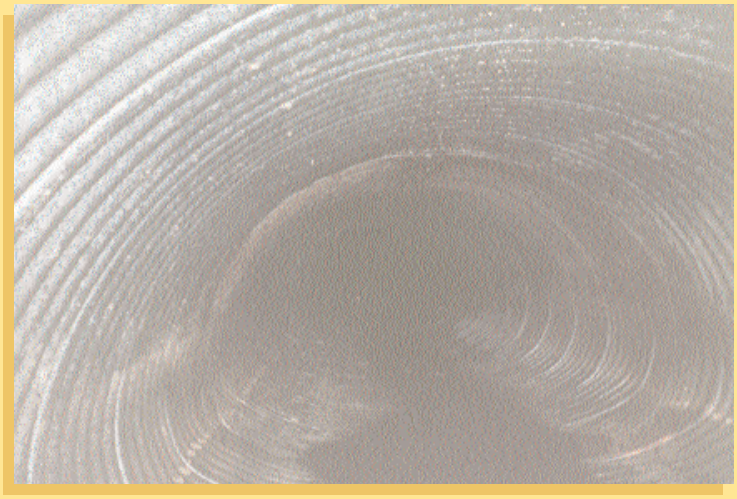
Land Use: Residential (SFH)

Location: Fairfax City, Virginia

Comments:

Light staining in invert.

.SITE.17.



Condition Rating

Top 100

Sides 100

Invert 95/100

Avg. Rating.....**99.2**

Age: 5 years

Coating Type: Fully Bituminous Coated

Diameter: 65"x107"

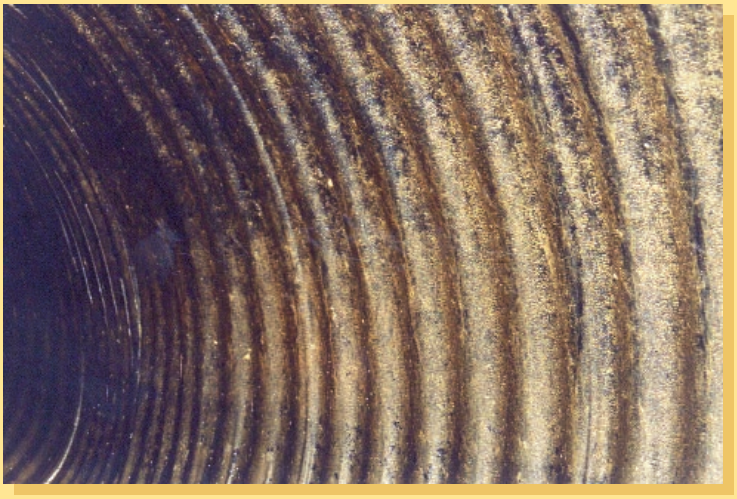
Corrugation: 1x5" Helical

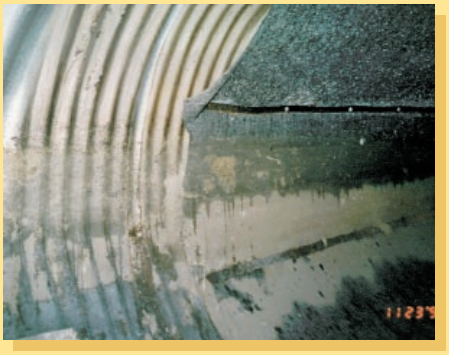
Land Use: Residential

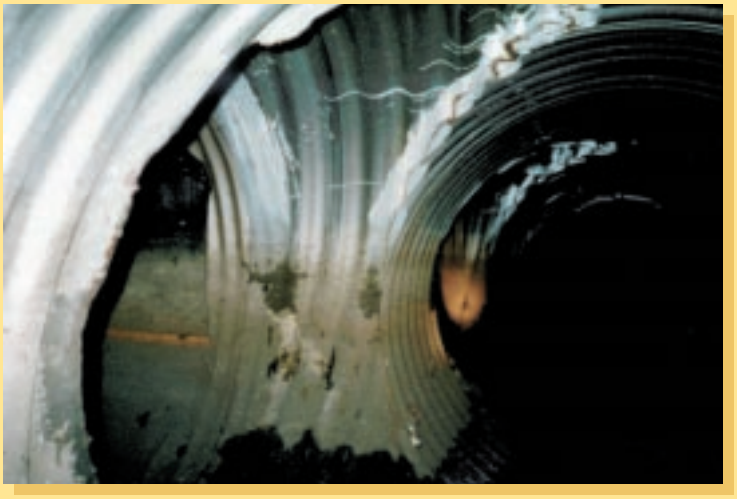
Location: Fairfax City, Virginia

Comments:

Asphalt removed in some areas; no rust on exposed galvanized surface.







Condition Rating

Top 95/100
Sides 95/100
Invert 95
Avg. Rating.....**96.7**

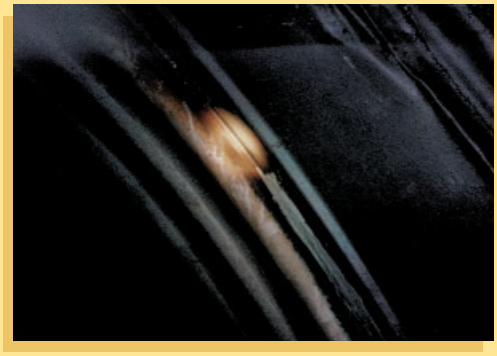
Age: 10 years
Coating Type: Galvanized
Diameter: 60"
Corrugation: 1x5" Helical
Land Use: Commercial
Location: Alexandria, Virginia

Comments:

Oil grit separator at entrance.

Non-woven geotextile inside pipe to minimize clogging of backfill stone.

.SITE.20.



Condition Rating

Top 95/100

Sides 95/100

Invert .....N/A

Avg. Rating.....**97.5**

Age: 5 years
Coating Type: Galvanized
Diameter: 120"
Corrugation: 1x5" Helical
Land Use: Residential
Location: Alexandria, Virginia

Comments:

Little to no debris; no signs of clogging; return valve open.

Condition Rating

Top	95
Sides	95
Invert	95
Avg. Rating	**95**

Age: 5 years
Coating Type: Galvanized
Diameter: 144"
Corrugation: 1x5" Helical
Land Use: Residential
Location: Alexandria, Virginia

Comments:

Detention system with sand filter.

The NCSPA would like to thank the following people for their assistance in this study:

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NOTES

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