

# STORM WATER MANAGEMENT MASTER PLAN

City of Los Altos

May 2010



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Prepared for

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Prepared by



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## **1 INTRODUCTION**

## 1.1 Background

The City of Los Altos is developing a storm water master plan to serve as a guide for future improvements and expansion of the City's storm water infrastructure. A component of the storm water master plan is to determine the condition of the existing storm water infrastructure. V&A was retained by Schaaf & Wheeler to assist with condition assessment services for storm water facilities for the City of Los Altos. The information from the condition assessment will be utilized to determine the requirements to make improvements to the existing infrastructure and to guide decisions for activities to ensure the reliability of these facilities.

The City of Los Altos incorporates a watershed area of approximately 7 square miles with 52 miles of pipe and 4 creeks. Pipe diameters range from 8 to 60 inches. Due to the hilly terrain, there are no storage ponds or pump stations within the service area. All flows in the drainage basin are directed via gravity flow through pipes to drain into the creeks which flow towards San Francisco Bay.



Figure 1.1. Overview of Los Altos Storm Drainage Area



The scope of the condition assessment was to identify deficient areas to determine the need for improvements. One important component of the storm water master plan is to present a methodology for conducting condition assessments and to present a program for continued assessment of the remainder of the storm water system. An assessment of the entire storm water collection system is beyond the scope of this study and would be cost prohibitive. Therefore, a representative portion of the storm system was selected to prepare the master plan. The portion of the storm water collection system identified for the condition assessment was based on areas of known deficiencies. The results of this condition assessment are included in this report and can be used to develop an on-going program for condition assessment of the remainder of the storm water collection system.

## 1.2 Methodology

V&A met with Schaaf and Wheeler and the City in order to determine areas for condition assessment. The City presented areas of known deficiencies within the storm water collection system based on previous maintenance issues. This provided a list of priority areas for further condition assessment. The condition assessment categorized issues based on whether the root cause was operational and maintenance related or due to physical structural deficiencies. The areas with known deficiencies are listed in Table 1-1 below.



Table 1-1				
Los Altos Sewer – List of Known Issues				

Item No.	Мар	Area	Known Issues	V&A Actions
1	M6	Woods Ln. at Citation Dr.	Debris from hillside	
2	M6	Foothill Expressway at El Sereno Ave.	Inlet clogs with debris	
3	K6	Fremont Ave. at Grant Rd.	Inlet clogs and floods intersection	
4	M5	Ditch between Windimer and Sierra Ventura Dr.	Ditch between properties, downstream inlet fills with debris and floods house and pool	
5	L4	Madelaine Ct.		
6	L5	Robinhood Ct.		
7	H3	Covington Rd. at Hale Creek	Creek Overflow - Undersized Pipe	Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements
8	G2	Viola PI.	Bubbling - Debris (toys)	Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements
9	C2	Catalina Ct.		
10	M6	Vineyard Dr. at Deodara Dr.	Does not drain	Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements
11	C3	Distal Dr.	Plugs due to debris	Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements
12	H5	Loma Prieta Ct.	Does not drain - Inlet too high	Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements
13	F4	Sunshine Dr.	Northside Plugs - Unsure "which northside"	Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements
14	J6	Ranchita Dr. at Julie	Drainage Issues - Crowned Road	
15	D2-C2	Cherry Ave.	Redwood roots in storm drains	Condition Assessment - Drive street look for trees close to storm drains and check for root intrusion
16	C3	Portola Ct. at Delphi Cir.		
17	H2	Summerhill Ave. at S. El Monte	Rocks/Debris	Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements
18	16	1270 Grant Ave. at Paula Ct.	Poor surface drainage	
19	J5	Heritage Ct.	No Curb and Gutter	Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements
20	14	Edge Ln.		Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements



Item No.	Мар	Area	Known Issues	V&A Actions
21	K6	1640 Dallas Ct.	Poor surface drainage - Low Spot	Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements
22	L6	1975 Grant Rd. at Woodland Library		
23	N6	Cristo Rey Dr. and Kring Way		Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements
24	M5	Trash rack and gate at 2100 Stonehavens		Condition Assessment, Pole Camera and Verification of Storm Drain Features/Measurements

Typically the list was populated based on maintenance issues such as poor drainage. Some areas identified as having poor drainage were areas where no curb and gutter, catch basins or physical drainage facilities existed. These areas were noted and the assessment was limited to observations of surface drainage and/or road grade.

For known issues with physical features, several condition assessment techniques were used. Using the City of Los Altos index maps, features were selected in close proximity to the areas where the issues had been reported. The assessment involved noting physical dimensions including grade to invert depth measurement of the structure (manholes, inlets, catch basins, etc.) and verification of inlet and outlet pipe diameter(s) and materials. Condition assessment techniques involved confined space entries, categorization and ratings of defect severity using the Vanda Index and NASSCO PACP/MACP standards. Observations were documented with digital photos, a handheld video camera or a pole-mounted zoom inspection camera.

V&A conducted field work on several dates (Jan. 19, Jan. 20, Jan. 26, Feb. 2, Feb. 10 and Mar. 9, 2010). On occasion, the field work coincided with rain events. During rain events, storm water flow prevented confined space entry access to some of the structures due to safety considerations. However, the observations made during storm events helped to find visual evidence of drainage deficiencies.



## 2 METHODS AND PROCEDURES

Evaluation methods are both qualitative and quantitative. Qualitative methods consisted of visual examinations and documentation with handheld video or pole-mounted zoom inspection camera. It is noted that qualitative condition assessment observations were based on the evaluator's expertise. The methods of condition assessment involved making confined space entries into some of the structures. For instances where storm water drainage features were located in high traffic areas the assessments were conducted at night to minimize disruptions to traffic.

## 2.1 Observations

Often, the optimal method for a structure condition assessment is a physical investigation involving a combination of visual observations, documented with digital photographs, measurement of defect area and physical tests of structural integrity. It should be noted that much of the condition assessment data is subjective and based on the evaluator's expertise.

## 2.2 Penetration Data

Penetration measurements involve applying a consistent level of force from a chipping hammer to the concrete surface and then measuring the depth of the resulting cavity. The depth of the cavity provides qualitative data on the hardness and condition of the concrete surfaces.

## 2.3 Concrete Condition Rating System

V&A developed the VANDA<sup>™</sup> Reinforced Concrete Condition Index Rating System as a means to consistently identify the condition of concrete. The concrete surfaces were rated according to Table 2-1, which summarizes this concrete rating system. The extent of the concrete damage can vary from Level 1 to Level 4, with Level 1 indicating the best case and Level 4 indicating severe damage.



## Table 2-1

## VANDA<sup>™</sup> Reinforced Concrete Condition Index Rating System

Level 1       No/Minimal Damage to Concrete         Hardness: No loss of hardness of mortar       Surface: No loss of smoothness         Cracking: No cracks       Spalling: No spalling         Reinforcing steel: Not exposed or damaged       Damage to Concrete Mortar         Hardness: Some loss of hardness of mortar       Surface: Small-diameter exposed aggregate         Cracking: Thumbnail-sized cracks of minimal frequency       Spalling: Shallow spalling of minimal frequency, no related reinforcing         Steel damage       Reinforcing steel: May be exposed but not damaged or corroded         Level 3       Loss of Concrete Mortar/Damage to Reinforcing Steel         Hardness: Complete loss of hardness of mortar       Surface: Larger-diameter exposed aggregate         Cracking: ½-inch to ½-inch cracks, moderate frequency       Spalling: Deep spalling of moderate frequency         Spalling: Deep spalling of moderate frequency, related reinforcing steel       Jamage         Cracking: ½-inch to ½-inch cracks, moderate frequency       Spalling: Deep spalling of moderate frequency         Spalling: Deep spalling of moderate frequency, related reinforcing steel       Jamage         Deinforcing steel       Spalling of moderate frequency         Spalling: Deep spalling of moderate frequency       Spalling: Deep spalling of moderate frequency         Spalling: Deep spalling of moderate frequency       Spalling: Deep spalling of moderate frequency	Condition Rating	Description	Descriptive Photograph
Level 2       Damage to Concrete Mortar         Hardness: Some loss of hardness of mortar         Surface: Small-diameter exposed aggregate         Cracking: Thumbnail-sized cracks of minimal frequency         Spalling: Shallow spalling of minimal frequency, no related reinforcing         steel damage         Reinforcing steel: May be exposed but not damaged or corroded         Level 3         Level 3         Level 3	Level 1	No/Minimal Damage to Concrete Hardness: No loss of hardness of mortar Surface: No loss of smoothness Cracking: No cracks Spalling: No spalling Reinforcing steel: Not exposed or damaged	
Level 3 Loss of Concrete Mortar/Damage to Reinforcing Steel Hardness: Complete loss of hardness of mortar Surface: Larger-diameter exposed aggregate Cracking: ¼-inch to ½-inch cracks, moderate frequency Spalling: Deep spalling of moderate frequency, related reinforcing steel damage Deinforcing totally Eveneed demaged and extraded, but can be	Level 2	Damage to Concrete Mortar Hardness: Some loss of hardness of mortar Surface: Small-diameter exposed aggregate Cracking: Thumbnail-sized cracks of minimal frequency Spalling: Shallow spalling of minimal frequency, no related reinforcing steel damage Reinforcing steel: May be exposed but not damaged or corroded	
rehabilitated	Level 3	Loss of Concrete Mortar/Damage to Reinforcing Steel Hardness: Complete loss of hardness of mortar Surface: Larger-diameter exposed aggregate Cracking: ¼-inch to ½-inch cracks, moderate frequency Spalling: Deep spalling of moderate frequency, related reinforcing steel damage Reinforcing steel: Exposed, damaged and corroded, but can be rehabilitated	
Reinforcing Steel Severely Corroded/Significant Damage to Structure         Hardness: Complete loss of hardness of mortar         Surface: Large-diameter exposed aggregate         Cracking: ½-inch cracks or greater, high frequency         Spalling: Deep spalling at high frequency, related reinforcing steel         damage         Reinforcing steel: Corroded or consumed, loss of structural integrity	Level 4	Reinforcing Steel Severely Corroded/Significant Damage to Structure Hardness: Complete loss of hardness of mortar Surface: Large-diameter exposed aggregate Cracking: ½-inch cracks or greater, high frequency Spalling: Deep spalling at high frequency, related reinforcing steel damage Reinforcing steel: Corroded or consumed, loss of structural integrity	



# 2.4 NASSCO Manhole and Pipeline Assessment Condition Program (MACP & PACP)

V&A utilized the National Association of Sewer Service Companies (NASSCO) Manhole/Pipeline Assessment Condition Program (MACP/PACP) format for documenting conditions. NASSCO provides guidance on the classification of sewer and storm water infrastructure for both manholes and pipelines. NASSCO has developed the MACP and PACP standardized systems in order to provide a consistent condition assessment, as well as to provide the capability to benchmark conditions to track deterioration over time. The process provides a system for identifying and documenting specific defects for manholes and pipelines. Furthermore, the documentation includes taking note of physical structure dimensions which can be valuable in developing an asset management and maintenance program and can also provide useful information for determining rehabilitation options.

Two key concepts in asset management are criticality and condition severity. Critical assets can be classified as infrastructure where costs associated with the failure are likely to be high. These are generally strategically important assets where costs of failure are driven by high construction costs associated with repairs, costly traffic delays and impacts on property owners, customers and stakeholders. Critical ratings are assigned by the owner and help to prioritize which assets are investigated. Ratings of condition severity are provided by the PACP and MACP process and assist the owner in prioritizing the assets to be considered for renovation.

The PACP and MACP process identifies the major deterioration factors and assigns a rating that is related to the likelihood of failure or collapse. Deterioration factors include surrounding soil condition, position of groundwater table, frequency of surcharge events, above ground traffic loading, methods and materials used in construction, third party damages and defects such as roots and debris. It is important to note that the condition of manholes and pipes involves many deterioration factors, both internal and external. Visual inspection can only determine the internal defects that affect the condition.

Deterioration factors are classified into categories of structural defects and operational and maintenance (O&M) defects. Defects are assigned a grade of 1 to 5 in order of increasing severity, as described in Table 2-2.



## Table 2-2 NASSCO Ratings

Rating	Importance	Likelihood of Failure	Structural Rating Example	O&M Rating Example
1 Excellent	Minor defects	Failure unlikely in the foreseeable future		
2 Good	Defects that have not begun to deteriorate	Pipe unlikely to fail for at least 20 years	Longitudinal Cracking	Fine Roots
3 Fair	Moderate defects that will continue to deteriorate	Pipe may fail in 10 to 20 years	Multiple Fractures	Deposits = 15% (rating based on % of capacity affected)
4 Poor	Severe defects	Pipe will probably fail in 5 to 10 years	Broken Pipe	Infiltration – Runner (rating based on flow estimate)
5 Immediate Attention	Defect requires immediate action	Pipe has failed or will likely fail within the next 5 years	Collapsed Pipe	Convert 134:0 Free Transfer 124:0 Transfer 124:0 Free Transfer 124:0 Transfer 124:0 Free Transfer 124:0 Free

\* Example photos are for illustrative purposes taken from sewer system evaluations but are representative of similar defects in storm water systems.



## 2.5 Confined Space Entry

A confined space (Photo 2.1) is defined as any space that is large enough and so configured that a person can bodily enter and perform assigned work, has limited or restricted means for entry or exit, and is not designed for continuous employee occupancy. Title 8, Section 5158 of the California Code of Regulations provides the guidelines and rules for working in these environments. In general, the atmosphere must be constantly monitored for sufficient levels of oxygen (19.5 to 23.0%), and the absence of hydrogen sulfide (H<sub>2</sub>S) gas, carbon monoxide (CO) gas and lower explosive limit (LEL) levels. A typical confined space entry crew has at least three members: the entrant, the attendant and the supervisor. The entrant is the individual who will be performing the work. The entrant is equipped with personal protective equipment needed to perform the job safely, including a personal 4-gas monitor (Photo 2.2). If it is not possible to maintain line-of-sight with the entrant, then more entrants are required until line-of-sight can be maintained. The attendant is responsible for maintaining contact with the entrant(s) to monitor the atmosphere on another 4-gas monitor and maintaining records of all entrants, if there is more than one. The supervisor develops the safe work plan for the job at hand.



Photo 2.1 – Confined Space Entry



Photo 2.2 – Typical Personal 4-Gas Monitor



## **3 SUMMARY OF DEFECTS**

The purpose of the assessments was to document the condition of physical structure features and note defects that may require rehabilitation. Working from the list of known issues, V&A conducted field visits at these locations to assess conditions and note defects which impact the integrity and reliability of the storm water facilities. Most of the locations of features were as noted on the maps provided by the City. However, there were minor discrepancies with the actual location of some features.

The following subsections highlight some of the main observations made at each of the locations of known issues. Major deficiencies found during the assessments were documented with photos, handheld video, pole camera or a combination of these methods. While most of the features evaluated were in good condition, this section only presents the defects and summarizes options to address them. Full documentation of condition assessment observations is included in Appendix A.

## 3.1 Item 1 – Woods Lane at Citation Drive

#### Issue:

The City indicated that debris from the adjacent hillside creates blockages in this area (Figure 3.2).

#### Action:

V&A investigated this area on Jan. 20, 2010, using photo documentation.

#### Main Observations:

- There is a series of upstream check dams on the creek that are in poor condition (Photo 3.1).
- Storm water flow enters into the pipe channel and there is no debris/trash rack (Photo 3.2).
- Discussions with a local resident indicated that in the past a large tree branch had become lodged inside the pipe creating a surcharged flow condition. Backwater began to flood the low-lying areas adjacent to the townhomes (Photo 3.3).
- Physical features of the structures appeared to be new, without defects and were determined to be in good structural condition.
- Not all of the features were identified on the maps and there were slight discrepancies with the actual locations. Size information for this line was omitted from the maps, understating the size and importance of the line, which carries a large amount of flow from creeks.
- There is poor and limited access to the manhole structures.

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 3 (High probability of large debris entering into the storm water pipe creating an obstruction and causing a flooded condition)



- Consider installing a trash rack on the inlet to the storm water pipe. Otherwise, continued maintenance and cleaning of this line is suggested.
- Locate and expose all access points on the line and update maps with their actual locations.



Figure 3.1. Woods Lane at Citation Drive



Photo 3.2. Turbulence at inlet transition from box culvert to circular conduit



Photo 3.1. Upstream check dam



Photo 3.3. Drop inlet at MD6-119 where tree branch was reported to have become lodged



## 3.2 Item 2 – Foothill Expressway at El Sereno Avenue

#### Issue:

The inlets in this area are reported to have been clogged with debris (Figure 3.2).

#### Action:

V&A investigated this area on Jan. 20, 2010, using photo and handheld video documentation.

#### Main Observations:

- There is a low area in the offramp from Foothill Expressway near the Chevron gas station that floods due to lack of drainage or road grade (Photo 3.4).
- Water continues to pond until the height exceeds the street curb. The water then flows over the sidewalk, across the landscaping to the catch basin located at the apex of the curve for the right hand turn (Photo 3.6).
- The catch basin (Unknown J) at the south curb edge of Foothill Expressway at El Sereno Avenue does not appear on the maps (Photo 3.5).

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 2 (Water presents a potential hazardous condition to motorists and pedestrians)

#### **Recommendations for Follow-up Actions:**

 Install a curb cut, add an additional catch basin alongside the road, and/or correct the road grade to allow for proper drainage.



Figure 3.2. Foothill Expressway at El Sereno Avenue



Photo 3.4. Flooding at Foothill Expressway offramp





Photo 3.5. Unidentified catch basins (Unknown J) at the apex of the right hand turn onto Homestead



Photo 3.6. Looking south at flooded area

## 3.3 Item 3 – Fremont Avenue at Grant Road

#### Issue:

The inlets in this area are reported to become clogged and flood the intersection (Figure 3.3).

#### Action:

V&A investigated this area on Feb. 2, 2010, using photo and pole mounted zoom camera video documentation.

#### Main Observations:

- Some of the pipe inlets into the manhole appear to be full of sediment. It is unclear if these pipes are abandoned or still in service (Photo 3.8).
- The corrugated metal pipe appears to have sustained some third-party damage (Photo 3.9).
- Minor debris was observed in some of the catch basins (Photo 3.7).

#### **Overall Condition Rating:**

- Structural Rating = 2 (Vanda concrete condition = 1; some third party damage on corrugated metal pipe, integrity in question)
- O&M Rating = 2 (Some pipes observed to be filled with debris)

- Consider CCTV inspection of the corrugated metal pipe to assess condition.
- Clean pipes to clear debris and sediment buildup.





Figure 3.3. Fremont Avenue at Grant Road





Photo 3.7. Minor debris in catch basin



Photo 3.8. Sediment and large debris (bricks) in pipe

Photo 3.9. Corrugated metal pipe deflection at crown, possible third party damage

## 3.4 Item 4 – Ditch between Windimer and Sierra Ventura Drive

#### Issue:

The ditch in the easement between properties fills with debris causing water overflow into the backyards of some adjacent property owners (Figure 3.4).

#### Action:

V&A investigated this area with the City's assistance on Feb. 10, 2010, using photo and handheld video documentation.

#### Main Observations:

- The upper portion of the ditch is a cage-wrapped rock retaining wall (Photo 3.10). Drainage issues were not reported in this area.
- Portions of homeowner-made retaining wall improvements are collapsing (Photo 3.11).
- Dirt from the backyard hillsides and landscaping debris blocks the water flow through the concrete ditch. Temporary piping is in place to restore drainage (Photo 3.12).



- The easement also serves as access for a sanitary sewer manhole directly adjacent to the concrete ditch (Photo 3.13).
- The outlet of the ditch enters a corrugated metal pipe and the inlet to the pipe is partially obstructed (Photo 3.14).

#### **Overall Condition Rating:**

- Structural Rating = N/A (No structural component)
- O&M Rating = 4 (Very poor access)

- Consider CCTV inspection of the corrugated metal pipe to assess condition.
- Continue rock wall long the length of the pipe or equivalent structural storm drainage chambers to keep the hillside dirt from sliding and obstructing the drainage.



Figure 3.4. Ditch between Windimer and Sierra Ventura Drive



Photo 3.10. Cage-wrapped rock retaining wall





Photo 3.11. Collapsing retaining walls along drainage ditch



Photo 3.12. Temporary piping to restore drainage under debris



Photo 3.13. Sanitary sewer manhole in concrete ditch, shared easement



Photo 3.14. Outlet to corrugated metal pipe partially obstructed



## 3.5 Item 5 – Madelaine Court

#### Issue:

None specifically identified. Lack of drainage – Access limitations in easement (Figure 3.5).

#### Action:

V&A investigated this area on Jan. 20, 2010, using photo and handheld video documentation.

#### Main Observations:

- Appears to have greater flow to Catch Basin L4C-607 from hillside drainage from St. Joseph Ave. towards Madelaine Court (Photos 3.15 and 3.16).
- One feature, L4D-606, in easement could not be located between the cul-de-sac and Permanente Creek.

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 2 (limited easement access and one feature not located)

#### **Recommendations for Follow-up Actions:**

Locate storm drainage feature L4D-606.



Figure 3.5. Madelaine Court



Photo 3.15. L4C-607 catch basin





Photo 3.16. Storm water flow entering L4C-607 catch basin

## 3.6 Item 6 – Robinhood Court

#### Issue:

None specifically identified. Lack of drainage – Access limitations in easement (Figure 3.6).

#### Action:

V&A investigated this area on Jan. 20, 2010, using photo and handheld video documentation.

#### Main Observations:

- There are parallel lines along Robinhood Court, a 33-inch trunk line and a smaller local storm water collection system, both draining to Permanente Creek.
- There was some sediment buildup in the smaller 21-inch line. This appears to be due to shallower slopes of the storm pipes in this area (Photos 3.17 and 3.18).
- One feature, L5D-104, in easement could not to be located.

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 2 (some sediment buildup, limited easement access)

- Locate Storm Drainage Feature L5D-104.
- Clean the 21-inch line between Catch Basins L5C-108 and L5C-106.





Figure 3.6. Robinhood Court



Photo 3.17. Sediment buildup in 21-inch pipe



Photo 3.18. Shallow slope causes sediment buildup and restricts flow capacity

## 3.7 Item 7 – Covington Road at Hale Creek

#### Issue:

Creek overflows – Pipe is undersized (Figure 3.7).

#### Action:

V&A investigated this area on Jan. 20, 2010, using photo and handheld video documentation.

#### Main Observations:

- Hale Creek upstream of Covington Rd. is a natural creek bed. Hale Creek crosses under Covington Rd. and flows out into a concrete-lined channel. The box channel under Covington Rd. appears to be undersized to handle the creek flow (Photos 3.19 and 3.20).
- The flow is scouring around the outside edges of the upstream approach to the Covington box channel (Photo 3.21).
- Storm water outfall pipes protrude into the creek bed creating possible areas for debris to collect, potentially causing obstructions to flow.



#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 1

#### **Recommendations for Follow-up Actions:**

 Box channel may need to be upsized or an additional parallel channel constructed to alleviate the flow restriction.



Figure 3.7. Hale Creek at Covington Drive



Photo 3.20. Hale Creek downstream



Photo 3.19. Hale Creek downstream



Photo 3.21. Upstream structure, undermined along sides of channel – protruding outfalls

#### 3.8 Item 8 – Viola Place

#### Issue:

Drainage features overflow due to debris (toys) stuck in pipe (Figure 3.8).

#### Action:

V&A investigated this area on Jan. 20, 2010, using photo and handheld video documentation.



#### Main Observations:

- Catch Basin G2C-609 was observed to have been covered with pine needles (Photo 3.22).
- View of the downstream pipe indicates that some debris may be obstructing the flow (Photo 3.23).

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 2 (some debris obstructing flow)

#### **Recommendations for Follow-up Actions:**

Cleaning is recommended on the pipe between G2C-609 and G2D-610.



Figure 3.8. Viola Place



Photo 3.22. Catch Basin G2C-609 obstructed by pine needles



Photo 3.23. Downstream pipe partially obstructed with debris



## 3.9 Item 9 – Catalina Court

#### Issue:

None specifically identified. Poor drainage (Figure 3.9).

#### Action:

V&A investigated this area on Jan. 26, 2010, using photo and handheld video documentation.

#### Main Observations:

- Catch Basin C2C-315 was observed to have some light debris. The debris collects around the outlet pipe edges due to a protruding transition to the catch basin structure (Photo 3.24).
- Manhole C2D-314 has a 12-inch inlet from the south which is not shown on the maps. The pipe is dry, has some debris, and appears to be abandoned or no longer in service (Photo 3.26).
- Slight street surface ponding is occurring in front of 110 Catalina Court (Photo 3.25).

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1; outlet configuration restricts flow)
- O&M Rating = 1 (some light debris)

- Catch Basin C2C-315: cut or chip out outlet pipe edges. Use mortar to round edges into a smooth transition to pipe outlet from the catch basin.
- Slight ponding in front of Catalina Court could be alleviated by installing a catch basin and utilizing what appears to be a previously abandoned 12-inch pipe.



Figure 3.9. Catalina Court



Photo 3.24. Catch Basin C2C-315, poor transition to outlet pipe





Photo 3.25. Slight street surface ponding in front of 110 Catalina Court



Photo 3.26. 12-inch dry pipe with some sediment looking upstream south – not shown on maps

## 3.10 Item 10 – Vineyard Drive at Deodara Drive

#### Issue:

The City indicated that the intersection has poor drainage (Figure 3.10).

#### Action:

 V&A investigated this area on Jan. 26, 2010, and Feb. 2, 2010, using photos and handheld and pole-mounted zoom camera video documentation.

#### Main Observations:

- During a heavy rain downpour Manhole M6D-614 was observed surcharging due to the sudden increase in flow from multiple inlets.
- Manhole M6D-614 has multiple pipe inlets entering the structure at crossing angles. During rain events it was observed that turbulence is created with the crossing flow of multiple drop inlet pipes. The sudden increase in flow from catch basin inlets combined with the run off from the steep hillside causes the manhole to become quickly surcharged (Photo 3.27).
- The configuration of the inlets in Manhole M6D-614 causes turbulence in the structure. (Photo 3.24). One inlet also appears to enter at a lower elevation than the outlet.
- Manhole M6D-615 is incorrectly shown on the plans and is a sanitary sewer manhole.
- Manhole M6D-617 has what appears to be an abandoned pipe entering from the south.
- There is an additional manhole (Unknown G) not shown on the plans downstream from M6D-617 which receives inlet flow from the upstream piping and a drainage ditch on Foothill Expressway. This manhole is surcharged during storm events because the outlet pipe to the creek appears to have an invert lower than the creek bed, and the creek flow is obstructed downstream by vegetation.



#### **Overall Condition Rating:**

- Structural Rating = 2 (Vanda concrete condition = 1; poor design, configuration of too many inlets creates turbulence and outlet configuration restricts flow)
- ✤ O&M Rating = 1

- Downstream piping may need to be upsized or the storm system expanded to accommodate the flow in this drainage area.
- The outlet to the drainage creek needs to be modified by possibly trenching the creek bed deeper and wider so that the flow is not restricted.



Figure 3.10. Vineyard Drive at Deodara Drive



Photo 3.27. Manhole M6D-614 with multiple inlets, turbulent flows, potentially piping



Photo 3.28. Manhole M6D-617 with additional pipe from south, which appears abandoned and is not shown on the maps



Photo 3.29. Unidentified manhole (Unknown G) downstream of M6D-617 with outlet drainage to creek





Photo 3.30. Manhole downstream of M6D-617 which is surcharged due to poor outlet configuration to drainage creek bed



Photo 3.31. Outlet to creek is completely submerged

## 3.11 Item 11 – Distel Drive

Issue:

This area was identified as plugging periodically due to debris (Figure 3.11).

#### Action:

♦ V&A investigated this area on Jan. 26, 2010, using photo and handheld video documentation.

#### Main Observations:

- The pipe downstream of Catch Basin C3C-501 had cracks at a joint.
- Structure C3C-502 had a small mortar dam at the invert of the inlet pipe, which backed up water into the upstream pipe. The catch basin had slight debris and there was some sediment buildup downstream.

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 1 (Mortar obstruction causes some debris build up)

- Clean downstream pipe.
- Remove mortar dam at inlet to C3C-502.





Figure 3.11. Distel Drive



Photo 3.32. Catch Basin C3C-501, downstream pipe with cracks



Photo 3.33. Catch Basin C3C-502, mortar dam and backup in inlet



Photo 3.34. Catch Basin C3C-502, sediment in downstream pipe

## 3.12 Item 12 – Loma Prieta Court

#### Issue:

This area was identified as having poor drainage because the storm inlet is too high (Figure 3.12).

#### Action:

V&A investigated this area on Jan. 20, 2010, using photo and handheld video documentation.

#### Main Observations:

The inlet to Catch Basin H5F-404 is higher than the surrounding gutters, so large puddles form all around the end of the street. The rim-invert depth in the catch basin is only 13 inches.

#### **Overall Condition Rating:**

Structural Rating = 1 (Vanda concrete condition = 1)



O&M Rating = 2 (Surface ponding may result in more settling of debris)

#### **Recommendations for Follow-up Actions:**

Lower the inlet grating of Catch Basin H5F-404 below the surrounding gutters. This may not be feasible without lowering the outlet line since the catch basin is very shallow.



Figure 3.12. Loma Prieta Court



Photo 3.35. Catch Basin H5F-404 surrounded by ponding



Photo 3.36. Large puddle at end of Loma Prieta Court



Photo 3.37. Puddles approach but cannot enter Catch Basin H5F-404

## 3.13 Item 13 – Sunshine Drive

#### Issue:

This area was identified as plugging periodically on the north side (Figure 3.13).

#### Action:

 V&A investigated this area on Feb. 10, 2010, using photo and handheld video documentation.



#### Main Observations:

- Catch Basins F4F-212, F4F-204 and F4F-201 have inadequately sized grates and are half full of sediment (Photos 3.38 through Photo 3.44).
- Catch basins F4F-212 and F4F-201 have corrugated metal pipes. The pipes appear to be in good condition but the inlets from the catch basin are poorly constructed (Photos 3.38 through Photo 3.42).
- The pipe from catch basin F4F-204 is half full of sediment and directed upstream to discharge in to Hale Creek. When flows are elevated the creek could flow into this pipe and deposit sediment (Photos 3.43 to Photo 3.44).
- The access ramp to Hale Creek is directed upstream. When flows are elevated, the creek can begin to rise along side the access ramp and flow over the street (Photo 3.45).

#### **Overall Condition Rating:**

- Structural Rating = 2 (Vanda concrete condition = 1) Some of the corrugated metal pipes and older catch basins are in need of improvements
- O&M Rating = 3 (When creek flows are elevated pipes can become filled with debris)

- Reconstruct Catch Basins F4F-212, F4F-204 and F4F-201 to improve the flow to the outlet pipe.
- Clean pipes from F4F-212, F4F-204 and F4F-201 to remove sediment.



Figure 3.13. Sunshine Drive



Photo 3.38. Catch Basin F4F-212 undersized with protruding corrugated metal pipe outlet creating obstruction for sediment





Photo 3.39. Catch Basin F4F-212 corrugated metal pipe outlet half full of sediment



Photo 3.40. Catch Basin F4F-201 undersized



Photo 3.41. Catch Basin F4F-201 poorly constructed inlet



Photo 3.42. Catch Basin F4F-201 corrugated metal pipe outlet half full of sediment



Photo 3.43. Catch Basin F4F-204 half full of sediment



Photo 3.44. Catch Basin F4F-204 flows upstream into Hale Creek





Photo 3.45. Access ramp to Hale Creek near F4F-204. Creek flows over ramp (Sandbags)

## 3.14 Item 14 – Ranchita Drive at Julie Lane

Issue:

This area was identified as having drainage issues due to crowned road (Figure 3.14).

#### Action:

V&A investigated this area on Jan. 19, 2010, using photo and handheld video documentation.

#### Main Observations:

- Catch Basin J6C-225 does not have a sump but collects leaves that may clog the outlet.
- A local resident stated that he regularly cleans the catch basins in the area and that Ranchita Drive floods to the east of Julie Lane and Ranchita Court. This portion of the street does not have storm sewers and runoff collects in the ditches on either side of the roadway.
- ✤ Catch Basin J6F-228 could not be located.

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- ✤ O&M Rating = 1

- Add a sump to Structure J6C-225 to collect debris.
- Add storm inlets along Ranchita Drive east of Ranchita Court.





Figure 3.14. Ranchita Drive at Julie Lane



Photo 3.46. Catch Basin J6C-225 with leaves obstructing outlet

## 3.15 Item 15 – Cherry Avenue

#### Issue:

This area was identified as having redwood tree roots in the storm drains (Figure 3.15).

#### Action:

V&A investigated this area on Jan. 26, 2010, using photo documentation.

#### Main Observations:

 None – V&A investigated catch basins along Cherry Avenue and did not observe redwood tree roots in any of the catch basins. These lines may have already been cleaned to remove roots.

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 1 (No evidence of roots at the time of the evaluation)

#### **Recommendations for Follow-up Actions:**

Continue cleaning program to prevent roots.





Figure 3.15. Cherry Avenue

## 3.16 Item 16 – Portola Court at Delphi Circle

#### Issue:

✤ No specific issues were identified (Figure 3.16).

#### Action:

V&A investigated this area on Jan. 26, 2010, using photo and handheld video documentation.

#### Main Observations:

- The inlet to Manhole C3D-102 from C3C-103 enters the manhole facing upstream (Photo 3.47).
- The lines entering and leaving Manhole C3D-102 have about 1 inch of sediment (Photo 3.48).
- Catch Basin C3C-104 has about 3 inches of hard sediment or concrete at the outlet. This backs up flow in the catch basin but may allow debris to settle out (Photo 3.49).

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 2 (Configuration of lines and hard debris will necessitate continual cleaning)

- Reconfigure Manhole C3D-102 so that the inlets all flow in the downstream direction.
- Clean hard debris to allow better flow through the pipes




Figure 3.16. Portola Court at Delphi Circle



Photo 3.47. Manhole C3D-102 with inlet from C3C-103 entering in upstream direction



Photo 3.48. Outlet from Manhole C3D-102 with gravel deposits



Photo 3.49. Catch Basin C3C-104 with flow backed up

# 3.17 Item 17 – Summerhill Avenue at South El Monte Avenue

#### Issue:

This area was identified as having rocks and debris obstructing drainage (Figure 3.17).

### Action:

 V&A investigated this area on Jan. 20, 2010, and Feb. 2, 2010, using photo, handheld video, and pole mounted zoom camera documentation.

### Main Observations:

Catch Basin H2C-217 does not receive flow from H2C-218 as shown on the plans. This catch basin receives surface flow from both Summerhill and El Monte, but both gutters have low slopes which form puddles. The grating over this catch basin also collects debris, which may restrict its capacity during storm events. Moderately high amounts of flow were observed entering this catch basin during even a light rain (Photo 3.50 through Photo 3.55).



- Rocks and mud were found in the intersection adjacent to Catch Basin H2C-218, indicating potential overflow or back-up conditions at this catch basin (Photo 3.56).
- The line between Catch Basins H2C-216 and H2D-217 appears to have an obstruction or partial collapse which would restrict flow (Photo 3.57).

### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 2 (Debris from the road drainage creates ponding along street. Potential obstruction in one pipe observed)

#### **Recommendations for Follow-up Actions:**

- Construct additional storm inlets at the south corner of the intersection. Surface flows from Summerhill could be intercepted before they reach the base of the incline, where the slope is flat and ponding occurs. Likewise, flows from the south along El Monte could be collected at points south of the intersection before encountering the low, flat area next to the roadway.
- Provide a larger inlet area to Catch Basin H2C-218 to reduce potential for clogging.
- Use CCTV to investigate the line between Catch Basins H2C-216 and H2D-217 to identify obstruction.



Figure 3.17. Summerhill Avenue at South El Monte Avenue



Photo 3.50. Large puddle along El Monte south of H2C-217 due to flat slope





Photo 3.51. Ponding around H2C-217 in light rain with evidence of more severe ponding



Photo 3.53. Corner adjacent to H2C-218 with evidence of flooding



Photo 3.52. Inlet to H2C-217 with debris on grating with potential to obstruct flow



Photo 3.54. Inlet to H2C-218 with potential for debris to obstruct flow



Photo 3.55. Puddling between Catch Basins H2C-218 and H2C-219



Photo 3.56. Pipe defect between H2C-216 and H2D-217 with obstruction at invert



# 3.18 Item 18 – 1270 Grant Avenue at Paula Court

#### Issue:

This area was identified as having poor surface drainage (Figure 3.18).

#### Action:

V&A investigated this area on Jan. 19, 2010, and Feb. 2, 2010, using photos and handheld and pole-mounted zoom camera video documentation.

#### Main Observations:

- Catch Basin I6F-401 is susceptible to being covered by debris (palm leaves from nearby trees). The catch basin has collected 3 to 4 inches of sediment and debris (Photo 3.58).
- Manhole I6D-402 has no apparent connection to I6F-401.
- Another additional manhole (Unknown F) not shown on the plans, with a cover labeled for the City of Mountain View, is present on the 24-inch line just south of I6D-402 (Photo 3.59).

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 1

#### **Recommendations for Follow-up Actions:**

Clean Catch Basin I6F-401.



Figure 3.18. 1270 Grant Avenue at Paula Court



Photo 3.57. Accumulation of palm leaves near Catch Basin I6F-401





Photo 3.58. Pair of manholes at southwest corner of intersection (top—I6D-402; bottom—Unknown F)

# 3.19 Item 19 – Heritage Court

Issue:

This area was identified as having no curb and gutter (Figure 3.19).

### Action:

♦ V&A investigated this area on Jan. 19, 2010, using photo and handheld video documentation.

### Main Observations:

- Could not locate Feature J5F-303 (Photo 3.60)
- Pipe downstream from J5F-302 has some debris build up (Photo 3.61).

### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 2 (One feature not located. Easement in-between properties)

### **Recommendations for Follow-up Actions:**

- Conduct CCTV to locate J5F-303
- Clean lines from J5F-301 downstream through easement to Grant Rd.





Figure 3.19. Heritage Court



Photo 3.59. Catch Basin J5F-302 – Feature J5F-303 could not be located



Photo 3.60. Some debris build up in line downstream of Catch Basin J5F-302

# 3.20 Item 20 – Edge Lane

### Issue:

No specific issues were identified (Figure 3.20).

### Action:

V&A investigated this area on Feb. 10, 2010, using photo documentation.

### Main Observations:

 None – V&A investigated catch basins on Alvina Court and Manhole I4D-203 on Edge Lane and did not detect any major deficiencies. The storm line is in an easement preventing access for maintenance.

### **Overall Condition Rating:**

Structural Rating = 1 (Vanda concrete condition = 1)



O&M Rating = 2 (The concrete cover for Manhole I4D-203 is difficult to remove)

### **Recommendations for Follow-up Actions:**

Replace the concrete manhole cover for I4D-203 with a standard cast iron lid.



Figure 3.20. Edge Lane



Photo 3.61. Concrete cover for Manhole I4D-203

# 3.21 Item 21 - 1640 Dallas Court

#### Issue:

This area was identified as having poor surface drainage (Figure 3.21).

#### Action:

V&A investigated this area on Jan. 19, 2010, using photo and handheld video documentation.

### Main Observations:

Slight ponding at the end of Dallas Court and an abandoned Manhole K6F-225 (Photo 3.63)

#### **Overall Condition Rating:**

- Structural Rating = N/A (No structural component)
- O&M Rating = N/A (No operational and maintenance component)

#### **Recommendations for Follow-up Actions:**

Consider restoring storm water manhole and piping to Manhole K6F-225.



Figure 3.21. 1640 Dallas Court



Photo 3.62. Abandoned Manhole K6F-225

# 3.22 Item 22 – 1975 Grant Road at Woodland Library

### Issue:

• No specific issues were identified (Figure 3.22).

### Action:

V&A investigated this area on Jan. 19, 2010, and Feb. 2, 2010, using photos and handheld video documentation.

### Main Observations:

- Low spot for drainage along Foothill Expressway
- Catch basins were blocked with filter fabric due to construction at the library.
- Manhole L6F-117 was in good condition with only an inch of sediment. (Photo 3.64)
- ✤ Gutter Drain L6F-118 on northbound Foothill Expressway connects to Manhole L6F-117.

### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 1 (Some debris may be washed into storm pipe from ditch inlet in center of Foothill Expressway)

### **Recommendations for Follow-up Actions:**

Consider additional inspection with CCTV camera.



Figure 3.22. 1975 Grant Road at Woodland Library



Photo 3.63. Manhole K6F-225

# 3.23 Item 23 – Cristo Ray Dr. and Kring Way

### Issue:

• No specific issues were identified (Figure 3.23).

### Action:

V&A investigated this area on Jan. 20, 2010, using photo and handheld video documentation.

### Main Observations:

- Storm water runoff comes from the cul-de-sac on Kring Way and enters the driveway for access to water tanks. The storm water lines enter an easement alongside 1460 Kring Way. The easement limits maintenance access (Photo 3.67). This line is not shown or shown incorrectly on the maps, so the manholes have been labeled A–E going downstream.
- Fast velocities and the 90-degree bend creates turbulence at the manhole downstream of N6D-502 (Unknown A, Photo 3.65).
- Sheet flow on the driveway is prevented from entering the next downstream inlet due to the cross-slope of the pavement and a small asphalt berm (Unknown B, Photo 3.64).
- At Unknown D the storm water appears to flow into a drainage ditch (Photo 3.67). The drainage ditch is covered with vegetation and debris (Photo 3.68).
- Although not shown on the City maps, the storm water system continues parallel to Interstate 280. The catch basins in this area are covered with leaves (Photo 3.70).
- As an additional note, water was observed ponding around the perimeter of the water tanks (Photo 3.71).

### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 3 (Poor easement access restricts maintenance activities)



### **Recommendations for Follow-up Actions:**

- Improve access to easement for maintenance.
- Clear catch basins of debris and improve inlet near drainage ditch.
- Inform agency with ownership over the water tanks regarding inadequate surface drainage.



Figure 3.23. Cristo Ray Dr. and Kring Way



Photo 3.65. Turbulence at Unknown A



Photo 3.64. Catch Basin Unknown B



Photo 3.66. Unknown C located in utility easement alongside water tanks





Photo 3.67. Flow into drainage ditch



Photo 3.68. Drainage ditch with leaves and debris



Photo 3.69. Catch basin not shown on maps parallel to Interstate 280 covered with leaves



Photo 3.70. Note of inadequate surface drainage around perimeter of water tanks

# 3.24 Item 24 – Gate at Stonehaven Drive and Sierra Ventura Drive

#### Issue:

The City indicated that there were issues with debris getting stuck on the bar screen behind 2100 Sierra Ventura Drive. Also there is a gate structure located in the intersection of Stonehaven Drive and Sierra Ventura Drive which was paved over (Figure 3.24).

#### Action:

V&A investigated this area with assistance from the City on Feb. 10, 2010 and Mar. 9, 2010, by confined space entry using photo documentation and handheld video documentation.

### Main Observations:

- The bar screen behind 2100 Sierra Ventura often gets blocked with debris. The homeowner routinely clears the debris from the bar screen to maintain his property (Photo 3.72).
- The creek flows through a gate which provides a structure for debris to collect (Photo 3.74).



- Due to periods of elevated creek flows the homeowner added a 12-inch drainage pipe with grating from the creek to the front of the home (Photo 3.73).
- Manhole M5D-216 is not located as shown on the maps. It is located alongside the driveway to 2100 Sierra Ventura Drive in the landscaped area (Photo 3.75 and Photo 3.76).
- The pipe added by the homeowner does not connect to the City's Catch Basin M5C-208. It terminates just short in the utility lawn under shrubs adjacent to the fire hydrant (Photo 3.77 and Photo 3.78).
- The gate structure at M5D-207 is paved over (Photo 3.79).
- The Gate Structure M5D-207 was evaluated from a confined space entry proceeding upstream from Catch Basin M5F-206 (Photo 3.79). The gate, gate rails and gate stem all appear to be operational and in good/serviceable condition (Photo 3.80).
- The gate is set at 10-inches above the invert of the structure (Photo 3.81). Flow levels exceeding 10-inches will flow over the gate into the 18-inch pipe flowing north to Manhole M5D-205 (Photo 3.82).

#### **Overall Condition Rating:**

- Structural Rating = 1 (Vanda concrete condition = 1)
- O&M Rating = 3 (Access for maintenance is limited because the gate structure is paved over)

#### **Recommendations for Follow-up Actions:**

- Improve creek channel approach to bar screens to alleviate debris from blocking the bar screen.
- Remove the asphalt over the Gate Structure M5D-207 and elevate the hatch to match road grade.
- Exercise the gate periodically to ensure it is operational.
- Based on the model prediction of storm water flows, the level of the gate structure may need to be repositioned to optimize storm water flows to each outlet.



Figure 3.24. Gate at Stonehaven Drive and Sierra Ventura Drive



Photo 3.71. Bar screen behind 2100 Sierra Ventura





Photo 3.72. Additional 12-inch drainage pipe and grating improvement



Photo 3.74. View of Manhole M5D-216 looking south



Photo 3.76. 12-inch additional drainage pipe terminates under hedges near M5C-208



Photo 3.73. Fencing and gate upstream of bar screens



Photo 3.75. View of Manhole M5D-216 looking north



Photo 3.77. View of 12-inch drainage pipe under hedges





Photo 3.78. Marking paint outline of Gate Structure M5D-207



Photo 3.80. Inside of structure – View of gate position 10-inchs above invert – looking south



Photo 3.79. Inside of structure – Wheel for adjusting gate position



Photo 3.81. Inside of structure – View over gate approximately 8 foot drop to 18-inch inlet below – looking south



# 4 CONCLUSIONS

V&A presents the following conclusions based on the results of the condition assessments:

- The majority of the storm water infrastructure evaluated was in satisfactory condition. Many of the features such as catch basins, manholes and associated pipelines were not structurally compromised.
  - Many of the features evaluated were assigned a VANDA Level 1 rating, indicating only minimal damage to concrete surfaces.
  - Deterioration due to corrosion was determined not to be a prevalent issue. There were
    observations of a few corrugated metal pipes used in the storm water system. These
    pipes are more susceptible to corrosion. Based on the condition assessment the pipes
    evaluated appear to be in good condition. However, this observation is limited to vantage
    point and/or visibility of the zoom camera. It is recommended that additional CCTV
    inspection be conducted in the corrugated metal pipes to assess potential corrosion
    damage.
- Over 90 individual features were thoroughly documented during the condition assessment. The predominant findings were areas found to have inadequate drainage. Supplemental observations noted that some of the lines had debris and sediment build up causing the drainage issues. To a lesser extent some of the drainage issues were determined to be caused by poor initial construction and/or design.
- Access limitations for some of the areas evaluated are making routine maintenance of these facilities challenging.



# 5 RECOMMENDATIONS

Based on the condition assessments, V&A presents the following recommendations for the City's consideration:

- Miscellaneous improvements identified in this report for the features evaluated should be undertaken to improve serviceability and reliability of these assets.
- The City should consider contracting with a company to provide as-needed cleaning and CCTV inspection services. The contractor would supplement the existing City staff and provide additional capabilities to clean pipelines, remove obstructions and document conditions with CCTV inspection.
  - Additionally the contractor can help facilitate locating and restoring access to features which have become buried, paved over or otherwise currently inaccessible for maintenance activities.
  - A routine cleaning schedule should be established for some of the smaller diameter lines particularly where the lines are located in easements between private properties.
- It is recommended that the City continue to expand the condition assessment of storm water infrastructure using the information in this report as a guide to categorize structural and O&M defects with grade ratings of 1 to 5. Results from development of the storm water model may offer guidance to identify pipelines that are under capacity or have inadequate slopes to convey projected peak storm water flows. Such pipelines would be more critical assets and would represent the next group of areas targeted for condition assessment activities.
  - Ultimately, prioritization of additional areas for condition assessment should include a subjective evaluation of the criticality of the assets. Critical assets can be classified as those where potential external impacts (public, traffic, environmental) of failure are likely to be high. The City should investigate the criticality of the storm water infrastructure in order to evaluate costs associated with construction and potential impacts to property owners.
- Results of condition assessment documentation should be linked to the assets in the City's GIS system for benchmarking and future reference. The asset inventory can be updated based on actual field conditions.
- Where possible, efforts should be made to standardize design and construction of the drainage catch basins, manholes and associated piping to the extent possible to reduce maintenance efforts.
- Storm water collection infrastructure is a dynamic system. Conditions may be subject to change over time resulting in greater deterioration of the infrastructure. It is recommended that the system be monitored periodically to update for changes in condition. Considering the generally good condition of the assets evaluated, is it suggested that the frequency of re-evaluation be conducted on a 10 to 15-year cycle. Should conditions indicate that deterioration has advanced dramatically during this time frame; the re-evaluation interval can be adjusted to a 5-year cycle.



# APPENDIX A: DESCRIPTION OF APPENDIX

### **General Observations**



Storm inlet near parking lot at end of Citation Dr.



Storm inlet near parking lot at end of Citation Dr.



Storm inlet near parking lot at end of Citation Dr.



Storm inlet near parking lot at end of Citation Dr.



Storm inlet near parking lot at end of Citation Dr.



Pool behind dam upstream of M6D-120



### **General Observations**



Check dam upstream of M6D-120



Check dam upstream of M6D-120

### M6D-118?



Check dam upstream of M6D-120



Check dam upstream of M6D-120

Location:	Wo	ods Ln.			
Map sheet:	M6				
Date:	1/20	)/2010			
Weather:	Ligh	nt rain			
Location code:	Eas	ement/Right of wa	ıy		
Surface type:	Gra	ss/dirt			
Rim-invert:	9.4	ft.			
Diameter/size:					
Cover/grate size:					
Sediment:	Nor	e			
Pipe connections	:	Pipe (Direction)	Diameter	Material	Rim-invert
		Inlet			8.6 ft.
		Outlet			9.8 ft.

VANDA rating (structure):

1



# Item 1 - Woods Ln at Citation Dr.

### M6D-118?

VANDA rating (pipes):

Notes:

Very high velocity; flow from creek, diverted at dam at Woods Ln. & Citation Dr.; susceptible to burial/overgrowth; resident indicated blockage and overflow several years prior.

**Recommendations:** 

Update GIS/maps to show importance of line.



Area view showing susceptibility to burial



Plan view

#### M6D-119?

Location:	Woods Ln.		
Map sheet:	M6		
Date:	1/20/2010		
Weather:	Light rain		
Location code:	Easement/Right of way		
Surface type:	Grass/dirt		
Rim-invert:			
Diameter/size:			
Cover/grate size:			
Sediment:			
Pipe connections:			
VANDA rating (structure):			
VANDA rating (pipes):			
Notes: Grated inlet; high-velocity flow audible; susceptible to burial/overgrowth.			
Recommendation	IS:		



### M6D-119?



Area view showing susceptibility to burial



Area view showing susceptibility to burial

### Unknown I

Location:	Woods Ln.		
Map sheet:	M6		
Date:	1/20/2010		
Weather:	Light rain		
Location code:	Easement/Right of way		
Surface type:	Grass/dirt		
Rim-invert:			
Diameter/size:			
Cover/grate size:			
Sediment:			
Pipe connections:			
VANDA rating (structure):			
VANDA rating (pipes):			
Notes:			

Grated inlet; may not be directly on trunk line; high-velocity flow audible; susceptible to burial/overgrowth.



# Item 1 - Woods Ln at Citation Dr.

# Unknown I



Area view

### M6D-120?

Location:	Woods Ln. & Citation Dr.			
Map sheet:	M6			
Date:	1/20/2010			
Weather:	Light rain			
Location code:	Easement/Right of way			
Surface type:	Concrete collar			
Rim-invert:				
Diameter/size:				
Cover/grate size:				
Sediment:				
Pipe connections:				
VANDA rating (structure):				
VANDA rating (pipes):				
Notes:				
Creek inlet from	dam overflow; high-velocity, turbulent flow; no trashrack visible.			



### M6D-120?



Inlet above creek inlet



Inlet above creek intake showing turbulent flow



Turbulence at inlet transition from box culvert to circular conduit; no trashrack

### **General Observations**



Ponding on offramp from Foothill Expwy., looking north



Ponding on offramp from Foothill Expwy., looking south

### Unknown J (catch basins)

Location:	Foothill Expwy. at El Sereno Ave.			
Map sheet:	M6			
Date:	1/19/2010			
Weather:	Light rain			
Location code:	Sidewalk			
Surface type:	Grass/dirt			
Rim-invert:				
Diameter/size:				
Cover/grate size:				
Sediment:				
Pipe connections:				
VANDA rating (structure):				
VANDA rating (pipes):				





Ponding on offramp from Foothill Expwy., looking north

# Item 2 - Foothill at El Sereno

### Unknown J (catch basins)

Notes:

Pair of catch basins near large ponded area; did not investigate; may not be City structures.



Area view looking northwest



Area view looking south



Area view looking north



Area view looking southwest at apex of turn onto Homestead

# Item 3 - Fremont and Grant

### J6D-409

Location:	Gra	nt Rd. & Fremont	Ave.	
Map sheet:	J6			
Date:	2/2/	2010		
Weather:	Dry			
Location code:	Mai	n highway - Urban	thoroughfare, 4	lane street, heavy traffic
Surface type:	Asphalt			
Rim-invert:	17.2 ft.			
Diameter/size:	Diameter/size: 48 in.			
Cover/grate size:				
Sediment:				
Pipe connections:		Pipe (Direction)	Diameter	Material
		Inlet A (N)	36 in.	Concrete
		Inlet B (S)	24 in.	Concrete

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet A (N)	36 in.	Concrete	17.2 ft.
Inlet B (S)	24 in.	Concrete	8.7 ft.
Inlet C (SW)	12 in.	Concrete	12.2 ft.
Inlet D (W)	18 in.	Concrete	8.6 ft.
Outlet (E)	36 in.	Concrete	17.2 ft.

VANDA rating (structure):

VANDA rating (pipes):

Notes:

About 2 inches of gravel in 36-inch line downstream.

1

1

**Recommendations:** 



Plan view



North outlet to J6D-408



### J6D-409



Southeast inlet



Southwest inlet from K6F-101



South inlet from K6D-103



West inlet from J5D-614



Southwest inlets

# K6D-103

Location: Grant Rd. & Fremont Ave.

Map sheet:

K6



# K6D-103

Date:	2/2/2010
Weather:	Dry
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic
Surface type:	Asphalt
Rim-invert:	8.1 ft.
Diameter/size:	

Cover/grate size:

Sediment:

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet A (S)	24 in.	Concrete	8.1 ft.
Inlet B (W)	12 in.	Concrete	7.1 ft.
Outlet (N)	24 in.	Concrete	8.1 ft.

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Inlet B (12-inch line from west) is plugged.

1

1

Recommendations:



Plan view



North outlet



### K6D-103





South inlet

West inlet, plugged

### K6F-101

Location:	Grant Rd. & Fremont Ave.
Map sheet:	K6
Date:	2/2/2010
Weather:	Dry
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic
Surface type:	Concrete collar
Rim-invert:	6.1 ft.
Diameter/size:	36x36 in.
Cover/grate size:	35x41 in.
Sediment:	
Pipe connections:	Pipe (Direction) Diameter Material

1

1

IS:	Pipe (Direction)	Diameter	Material	Rim-invert
	Outlet	12 in.	Concrete	

VANDA rating (structure): VANDA rating (pipes):

Notes:



# K6F-101





Plan view

Outlet

### K6F-104

Location:	Grant Rd. & Fremont Ave.	
Map sheet:	K6	
Date:	2/2/2010	
Weather:	Dry	
Location code:	Main highway - Urban thoroughfare, 4	lane street, heavy traffic
Surface type:	Concrete collar	
Rim-invert:	4.9 ft.	
Diameter/size:	35x35 in.	
Cover/grate size:	35x41 in.	
Sediment:		
Pipe connections:	Pipe (Direction) Diameter	Material

1

S:	Pipe (Direction)	Diameter	Material	Rim-invert
	Outlet	15 in.	Concrete	
			•	

VANDA rating (structure):

VANDA rating (pipes): 1 Notes:



### K6F-104



Plan view



Outlet

### J6D-408

Location:	Grant Rd. & Fremont Ave.
Map sheet:	J6
Date:	2/2/2010
Weather:	Dry
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic
Surface type:	Asphalt
Rim-invert:	16.9 ft.
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	Pipe (Direction) Diameter Material

Pipe (I	Direction)	Diameter	Material	Rim-invert
Inlet A	(NW)	12 in.	Corrugated metal, coal tar coated	4.0 ft.
Inlet B	(S)	36 in.	Concrete	
Inlet C	(W)	12 in.	Concrete	8.4 ft.
Outlet	(N)	36 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes): 1

Notes:

Rough concrete in channel but no sediment.

1



### J6D-408



Plan view



Northeast inlet



West inlet

# K6D-102

Location:

Map sheet:

Grant Rd. & Fremont Ave. K6





North outlet



South inlet



Northeast inlet

# Item 3 - Fremont and Grant

# K6D-102

Date:	2/2/2010			
Weather:	Dry			
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic			
Surface type:				
Rim-invert:				
Diameter/size:				
Cover/grate size:				
Sediment:	Sediment:			
Pipe connections:				
VANDA rating (structure):				
VANDA rating (pipes):				
Notes:				
Could not locate	9.			
Recommendation	S:			

### K6D-133

Location:	Grant Rd. & Fremont Ave.			
Map sheet:	K6			
Date:	2/2/2010			
Weather:	Dry			
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic			
Surface type:				
Rim-invert:				
Diameter/size:				
Cover/grate size:	Cover/grate size:			
Sediment:	Sediment:			
Pipe connections:				
VANDA rating (structure):				
VANDA rating (pipes):				
Notes:				
Could not locate.				
Recommendation	S:			

# Unknown L (catch basin)

Location: Grant Rd. & Fremont Ave.



**Rim-invert** 

# Item 3 - Fremont and Grant

# Unknown L (catch basin)

Map sheet:	J6			
Date:	2/2/2010			
Weather:	Veather: Dry			
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic			
Surface type:	Concrete collar			
Rim-invert:	2.6 ft.			
Diameter/size:	23x35 in.			
Cover/grate size: 24x41 in.				
Sediment:	Sediment: 12 in. (leaves/dirt)			
Pipe connections:	Pipe (Direction)	Diameter	Material	
	Outlet	12 in.	Corrugated metal, coal tar coated	
VANDA rating (structure): 1				

VANDA rating (pipes):

Notes:

Adjacent and connected to J6D-408 in median; upstream side of basin has about 12 inches of debris; may clog.



Plan view, minor debris



Minor debris in catch basin



### Unknown L (catch basin)



Outlet with deflection at crown, possible thirdparty damage

### J6F-407

Location:	Grant Rd. & Fremont Ave.
Map sheet:	J6
Date:	2/2/2010
Weather:	Dry
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic
Surface type:	Asphalt
Rim-invert:	3.6 ft.
Diameter/size:	24x29 in.
Cover/grate size:	23x25 in.
Sediment:	
Pipe connections:	Pipe (Direction) Diameter Material

nven

VANDA rating (structure):

1

1

VANDA rating (pipes):

Notes:

Debris in all inlets.



# J6F-407



Plan view



South inlet, plugged, with debris



East outlet



West inlet, south of pair, with debris



West inlet, north of pair, with debris


#### General Observations



Area view at 2101 Stonehaven

#### M5D-205

Location:	Stonehaven Dr. & Kent Dr.				
Map sheet:	M5				
Date:	1/20	)/2010			
Weather:	Ligh	it rain			
Location code:	Ligh	it highway (rural st	reets, residentia	al neighborhood and parking areas)	
Surface type:	Asp	halt			
Rim-invert:	8.8	ft.?			
Diameter/size:					
Cover/grate size:					
Sediment:					
Pipe connections:		Pipe (Direction)	Diameter	Material	

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet A	18 in.	Concrete	
Inlet B	12 in.	Corrugated metal, coal tar coated	6.8 ft.?
Outlet	18 in.	Concrete	

VANDA rating (structure):

1

1

VANDA rating (pipes):

Notes:

Rim-invert may be incorrect; Inlet B has coal tar coating intact at invert, otherwise slight corrosion.



#### M5D-205



Area view



Outlet



Ditch between Windimer and Sierra Ventura

Inlet B



Plan view



Inlet A



Inlet B

## Unknown N

Location:

Map sheet:

M5



## Item 4 - Windimer and Sierra Ventura

## Unknown N

Date:	2/10/2010

Weather: Dry

Location code: Easement/Right of way

Surface type: Grass/dirt

Rim-invert:

Diameter/size:

Cover/grate size:

Sediment:

Pipe connections:	Pipe (Direction)	Diameter	Material	Rim-invert
	Outlet	12 in.	Corrugated metal, coal tar coated	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Open concrete channel with damaged retaining walls. Channel fills with debris from hillside and yard trimmings.

## Recommendations:

Stormtech chambers or rock wall as done upstream.



Cage-wrapped rock retaining wall



Typical view along ditch



#### Unknown N



Sanitary sewer manhole in concrete ditch; shared easement



Inlet to ditch from adjacent property



Typical view along ditch



Ditch passing below homeowner fence



Retaining wall along ditch



Collapsing retaining walls



#### Unknown N



Typical view along ditch



Temporary piping to restore drainage under debris



Temporary piping to restore drainage under debris



Typical view along ditch



Sanitary sewer manhole in concrete ditch; shared easement



Outlet to corrugated metal pipe with sediment/debris



#### Unknown N



Transition from ditch to corrugated metal pipe



Typical view along ditch



# Item 5 - Madelaine Ct.

## L4C-607

Location:	Mac	Madelaine Ct.			
Map sheet:	L4				
Date:	1/20	)/2010			
Weather:	Ligh	it rain			
Location code:	Ligh	t highway (rural s	treets, residenti	al neighborhood and parking areas)	
Surface type:	Con	crete pavement			
Rim-invert:	3.5	ft.			
Diameter/size:	36x	36 in.			
Cover/grate size:	28x	37 in.			
Sediment:	Non	е			
Pipe connections:		Pipe (Direction)	Diameter	Material	Rim-invert
		Outlet	12 in.	Concrete	
VANDA rating (str	uctu	re): 1			
VANDA rating (pip	oes):	1			
Notes:					



Area view



As-found surface conditions

## L4C-607



Grating with storm flow entering catch basin



Outlet



Storm flow entering catch basin



Outlet



## Item 6 - Robinhood Ct.

## **General Observations**



View from Robinhood Dr. up Nottingham Way

## L5D-107

Location:	Robinhood Ln. & Crooked Creek Dr.					
Map sheet:	L5					
Date:	1/20	)/2010				
Weather:	Ligh	nt rain				
Location code:	Ligh	nt highway (rural s	treets, residentia	al neighborhood and parking areas)		
Surface type:	Asp	Asphalt				
Rim-invert:	6.5	6.5 ft.				
Diameter/size:						
Cover/grate size:						
Sediment:	4-5	in. (silt/grit/sand)				
Pipe connections:		Pipe (Direction)	Diameter	Material	Rim-invert	
		Inlet	21 in.	Concrete		
		Outlet	21 in.	Concrete		

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Sediment extends upstream and downstream; low velocity.

1

1



## L5D-107



Area view



Plan view



Outlet



Area view at Robinhood Ln. & Crooked Creek Dr.



Outlet with grit/gravel



Inlet with grit/gravel



# Item 6 - Robinhood Ct.

## L5D-107



Inlet

## L5D-112

Location:	Robinhood Ln.					
Map sheet:	L5	L5				
Date:	1/20	)/2010				
Weather:	Ligh	Light rain				
Location code:	Light highway (rural streets, residential neighborhood and parking areas)					
Surface type:	Asphalt					
Rim-invert:	13.8 ft.					
Diameter/size:						
Cover/grate size:						
Sediment:	Non	e				
Pipe connections:		Pipe (Direction)	Diameter	Material	Rim-invert	
		Inlet	~33 in.	Concrete		

~33 in.

Concrete

VANDA rating (structure):

Outlet

1

VANDA rating (pipes):

Notes:

Very high velocity.



## L5D-112



Area view



Area view looking west, showing proximity to L5C-110



Area view looking northwest



Plan view

## L5C-110

Location:	Robinhood Ln. & Robinhood Ct.				
Map sheet:	L5				
Date:	1/20/2010				
Weather:	Light rain				
Location code:	Light highway (rural streets, residential neighborhood and parking areas)				
Surface type:	Concrete pavement				
Rim-invert:					
Diameter/size:					
Cover/grate size:					
Sediment:	Sediment:				
Pipe connections:					
VANDA rating (structure):					
VANDA rating (pipes):					



# Item 6 - Robinhood Ct.

## L5C-110

## Notes:

Did not open; flowing appropriately under light rain; flow destination unknown.

Recommendations:



Area view

Curb inlet

L	5	C-	1	1	1	

Location:	Robinhood Ln. & Nottingham Ct.				
Map sheet:	L5				
Date:	1/20/2010				
Weather:	Light rain				
Location code:	Light highway (rural streets, residential neighborhood and parking areas)				
Surface type:	Concrete pavement				
Rim-invert:					
Diameter/size:					
Cover/grate size:					
Sediment:					
Pipe connections:					
VANDA rating (str	ructure):				
VANDA rating (pip	VANDA rating (pipes):				
Notes: Did not open; flowing appropriately under light rain; flow destination unknown.					
Recommendations:					



# Item 6 - Robinhood Ct.

## L5C-111





Area view

Curb inlet

## L5C-108

Location:	Robinhood	Ln. & Robinhood Ct.
Map sheet:	L5	
Date:	1/20/2010	
Weather:	Light rain	
Location code:	Light highw	ay (rural streets, residential neighborhood and parking areas)
Surface type:	Concrete pa	avement
Rim-invert:		
Diameter/size:		
Cover/grate size:		
Sediment:		
Pipe connections:		
VANDA rating (str	ucture):	2
VANDA rating (pip	oes):	1
Notes:		
Sediment in cha	annel and pip	bes (on 21-inch line).



## L5C-108



Area view looking northwest



Outlet



Inlet transition with damage to concrete



Curb inlet



Inlet from L5C-111



Inlet



## L5C-108



Grit and gravel in channel



Sediment buildup at outlet



#### General Observations



Hale Creek at Cuesta Dr., looking north



Tree trimmings dumped by resident at Cuesta Dr. crossing of Hale Creek



Ponding on south side of Cuesta west of Hale Creek crossing, looking west



Hale Creek at Cuesta Dr., looking south



Catch basin west of creek crossing on Cuesta Dr., looking west



Ponding on south side of Cuesta Dr. west of Hale Creek crossing, looking east



#### **General Observations**



Ponding on south side of Cuesta Dr. west of Hale Creek crossing, looking east



Ponding on north side of Cuesta Dr. east of Hale Creek crossing, looking east

## Unknown K (creek)

Location:	Covington Rd. at Hale Creek				
Map sheet:	H3				
Date:	1/20/2010				
Weather:	Light rain				
Location code:					
Surface type:					
Rim-invert:					
Diameter/size:	Diameter/size:				
Cover/grate size:					
Sediment:					
Pipe connections:					
VANDA rating (structure):					
VANDA rating (pipes):					





Storm inlet on north side of Cuesta Dr. west of Hale Creek, looking east

#### Unknown K (creek)

Notes:

Creek culvert may be undersized; debris gives evidence of overflow roughly at pavement height.



Upstream view along creek



Downstream side of creek crossing



View downstream along creek



Inlet to culvert



View downstream along creek



Inlet to culvert



## Unknown K (creek)



Inlet to culvert



Downstream view through culvert



Inlet from gutter on Covington Rd.



Culvert outlet



Inlet from gutter on Covington Rd.



Storm inlet



## Unknown K (creek)



Inlets from gutters on Covington Rd.



Vegetation with debris showing overflow level



Vegetation in creekbed on upstream side of culvert



## Item 8 - Viola PI.

## G2C-609

Location:	Viol	a Pl.				
Map sheet:	G2	2				
Date:	1/20	)/2010				
Weather:	Hea	ivy rain				
Location code:	Ligh	nt highway (rural st	treets, residentia	al neighborhood a	nd parking areas)	
Surface type:	Cor	crete pavement				
Rim-invert:	3.1	ft.				
Diameter/size:	36x	36 in.				
Cover/grate size:	24x	36 in.				
Sediment:	1-2	in. (debris)				
Pipe connections:		Pipe (Direction)	Diameter	Mat	erial	Rim-invert
		Outlet	15 in.	Concrete		
VANDA rating (str	uctu	re): 1				
VANDA rating (pin	bes):	1				

VANDA rating (pipes):

#### Notes:

Inlet accumulates pine needles; pipe flows sluggishly (half full) under light rain, but a short downpour did not cause problems.



Area view



As-found condition with pine needles obstructing inlet



## G2C-609



Storm inlet after removing pine needles



Outlet partially obstructed by debris



## Item 9 - Catalina Ct.

#### **General Observations**



Slight surface ponding at 110 Catalina Ct.

#### C2C-315

Location:	Cat	Catalina Ct.			
Map sheet:	C2	2			
Date:	1/26	6/2010			
Weather:	Ligh	nt rain			
Location code:	Ligh	nt highway (rural st	treets, residentia	al neighborhood and parking areas)	
Surface type:	Cor	crete pavement			
Rim-invert:	2.5	ft.			
Diameter/size:	35x	35 in.			
Cover/grate size:	29x	37 in.			
Sediment:	6 in	. (leaves)			
Pipe connections:		Pipe (Direction)	Diameter	Material	Rim-inv
		Outlet	12 in.	Concrete	
VANDA rating (str	ructu	re): 1			
VANDA rating (pin	ces):	1			

VANDA rating (pipes):

Notes:

Outlet pipe protrudes into catch basin and catches debris; about 6 inches of leaves and other debris at outlet.

Recommendations:



ert

## C2C-315



Area view



Area view



Poor outlet transition



Area view



Storm inlet



Outlet



## Item 9 - Catalina Ct.

## C2C-315



Outlet with debris

## C2D-314

Location:	Cata	alina Way & Catal	ina Ct.		
Map sheet:	C2				
Date:	1/26	6/2010			
Weather:	Ligh	it rain			
Location code:	Ligh	it highway (rural st	treets, residentia	al neighborhood and parking areas)	
Surface type:	Asp	halt			
Rim-invert:	7.3	ft.			
Diameter/size:					
Cover/grate size:					
Sediment:					
Pipe connections:		Pipe (Direction)	Diameter	Material	F

IS:	Pipe (Direction)	Diameter	Material	Rim-invert
	Inlet A (E)	12 in.	Concrete	
	Inlet B (S)	12 in.	Concrete	
	Outlet (N)	12 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes): 1

1

Notes:

About 0.5 in. sediment in line from Catalina Ct.; small debris downstream; inlet from south appears to be abandoned (dry dirt in line); runoff flows across street from south to manhole (could add catch basin in gutter).



## C2D-314



Area view



Plan view



East inlet



Area view with runoff flowing towards manhole



North outlet



South inlet with debris



## C2D-314



Debris in south inlet



#### **General Observations**



View north along Deodara with ponding



View north along Deodara with ponding



Fence and creekbed along Foothill Expwy., looking south

#### M6F-607

Location:	Vineyard Dr. near Foothill Expwy.
Map sheet:	M6
Date:	1/19/2010
Weather:	Heavy rain
Location code:	Easement/Right of way
Surface type:	Grass/dirt
Rim-invert:	
Diameter/size:	
Cover/grate size:	
Sediment:	

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Outlet		Concrete	

VANDA rating (structure):



## Item 10 - Vineyard at Deodara

#### M6F-607

VANDA rating (pipes):

Notes:

Creek inlet to culvert below road; also has grated inlet/catch basin from road.

1



Area view looking northeast



Leaves and debris covering inlet grating



Area view looking south along Foothill Expwy. drainage ditch



Inlet grating with debris cleared



#### M6F-607



Inlet to culvert



Inlet from culvert



Structure walls

## M6O-606

Location: Map sheet: Vineyard Dr. near Foothill Expwy. M6



Downstream view inside culvert



Structure walls

#### M6O-606

Date:	1/19/2010
Weather:	Heavy rain

Location code: Easement/Right of way

Surface type: Grass/dirt

Rim-invert:

Diameter/size:

Cover/grate size:

Sediment:

Pipe connections:	Pipe (Direction)	Diameter	Material	Rim-invert
	Inlet		Concrete	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Creek outfall from culvert below road; creek backs up just downstream.

1

Recommendations:



Outfall to creek

#### M6D-614

Location:	Vineyard Dr. & Deodara Dr.
Map sheet:	M6
Date:	1/19/2010
Weather:	Heavy rain
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Asphalt
Rim-invert:	6.9 ft.
Diameter/size:	





Upstream view inside culvert

## M6D-614

Cover/grate size:

Sediment:

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet A			5.5 ft.
Inlet B			6.4 ft.
Inlet C			7.0 ft.
Inlet D			6.0 ft.
Outlet			6.9 ft.

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Invert of one inlet appears to be lower than invert of outlet.



Area view looking northwest



Plan view with turbulence from multiple inlets



Area view looking southeast



Multiple inlets, causing turbulence



## M6D-614



Multiple inlets, causing turbulence

#### M6C-612

Location:	Vineyard Dr. & Deodara Dr.		
Map sheet:	M6		
Date:	1/19/2010		
Weather:	Heavy rain		
Location code:	Light highway (rural streets, residential neighborhood and parking areas)		
Surface type:	Concrete pavement		
Rim-invert:			
Diameter/size:			
Cover/grate size:			
Sediment:			
Pipe connections:			
VANDA rating (str	ructure):		
VANDA rating (pipes):			
Notes:			
Flowing appropriately under heavy rain; did not attempt to open.			
Recommendation	S:		



## M6C-612



Area view looking west



Curb inlet

## M6C-611

Location:	Vineyard Dr. & Deodara Dr.
Map sheet:	M6
Date:	1/19/2010
Weather:	Heavy rain
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Concrete pavement
Rim-invert:	
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	
VANDA rating (str	ructure):
VANDA rating (pip	bes):
Notes:	
Flowing approp	riately under heavy rain; did not attempt to open.

## M6C-611



Area view looking west



Curb inlet

## M6C-613

Location:	Vineyard Dr. & Deodara Dr.
Map sheet:	M6
Date:	1/19/2010
Weather:	Heavy rain
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Concrete pavement
Rim-invert:	
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	
VANDA rating (structure):	
VANDA rating (pipes):	
Notes:	
Flowing appropriately under heavy rain; did not attempt to open.	


## M6C-613



Area view looking south



Curb inlet

#### M6C-616

Location:	Vineyard Dr. & Deodara Dr.	
Map sheet:	M6	
Date:	1/19/2010	
Weather:	Heavy rain	
Location code:	Light highway (rural streets, residential neighborhood and parking areas)	
Surface type:	Concrete pavement	
Rim-invert:		
Diameter/size:		
Cover/grate size:		
Sediment:		
Pipe connections:		
VANDA rating (structure):		
VANDA rating (pip	bes):	
Notes:		
Flowing approp	riately under heavy rain; did not attempt to open; connects to M6D-614.	



## M6C-616



Area view looking northeast



Curb inlet

#### M6D-615

Location:	Vineyard Dr. & Deodara Dr.
Map sheet:	M6
Date:	1/19/2010
Weather:	Heavy rain
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	
Rim-invert:	
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	
VANDA rating (str	ructure):
VANDA rating (pip	bes):
Notes:	
Could not locate	Э.
Recommendation	s:

#### M6D-617

Location:	Vineyard Dr. east of Deodara
Map sheet:	M6
Date:	1/19/2010
Weather:	Heavy rain
Location code:	Light highway (rural streets, residential neighborhood and parking areas)



#### M6D-617

Surface type: Asphalt

Rim-invert: 11.7 ft.

Diameter/size:

Cover/grate size:

Sediment:

Pipe connections:

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Inlet from south may be abandoned (very little flow during heavy rain).

Recommendations:



Area view looking west



Plan view during wet weather



Plan view during dry weather

#### Unknown G (manhole)

Location: Vineyard Dr. east of Deodara

SV&A

## Item 10 - Vineyard at Deodara

#### Unknown G (manhole)

Map sheet:	M6		
Date:	1/19/2010		
Weather:	Heavy rain		
Location code:	Light highway (rural streets, residential neighborhood and parking areas)		
Surface type:	Asphalt		
Rim-invert:			
Diameter/size:			
Cover/grate size:			
Sediment:			
Pipe connections:			
VANDA rating (str	ucture):		
VANDA rating (pip	bes):		
Notes:			

Combines flow from Vineyard into creek undercrossing; surcharged even in dry weather (creek elevation downstream of outfall may be higher).

Recommendations:



Area view looking northwest



Area view looking south



#### Unknown G (manhole)



Area view looking southwest



Plan view during dry weather



Plan view during wet weather, showing surcharged conditions due to creek outfall



Debris in and surcharged condition during dry weather due to creek outfall elevation



Debris in and surcharged condition during dry weather due to creek outfall elevation

#### Unknown H (outfall)

Location:

Vineyard Dr. east of Deodara



## Item 10 - Vineyard at Deodara

#### Unknown H (outfall)

Map sheet:	M6	
Date:	1/19/2010	
Weather:	Heavy rain	
Location code:	Easement/Right of way	
Surface type:	Grass/dirt	
Rim-invert:		
Diameter/size:		
Cover/grate size:		
Sediment:		
Pipe connections:		
VANDA rating (structure):		
VANDA rating (pip	bes):	
Notes:		

Surcharges under heavy rain (creek elevation downstream may be higher); not visible.

**Recommendations:** 

Clear/channelize creek to prevent surcharging.



Downstream view along creekbed



Outfall to creekbed, surcharged due to creekbed invert elevation downstream



## Unknown H (outfall)



Surcharged, stagnant condition at outfall during dry weather



**Rim-invert** 

# Item 11 - Distel Dr.

#### C3C-502

Location:	Distel Dr.				
Map sheet:	C3	C3			
Date:	1/26	1/26/2010			
Weather:	Ligh	it rain			
Location code:	Ligh	t highway (rural s	treets, residentia	al neighborhood and parking areas)	
Surface type:	Con	crete pavement			
Rim-invert:	3.3	3.3 ft.			
Diameter/size:	36x	36x36 in.			
Cover/grate size:	29x	38 in.			
Sediment:					
Pipe connections:		Pipe (Direction)	Diameter	Material	
		Inlet	12 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes):

#### Notes:

Sediment downstream; "dam" of cement mortar at inlet backs up flow a few feet.

12 in.

Recommendations:



Outlet

1

1

Area view



Curb inlet

Concrete



## C3C-502



Curb inlet



Outlet transition



Upstream pipe



Inlet grating



Sediment in downstream pipe



Upstream pipe with backup caused by mortar dam at inlet



## C3C-502



Outlet



Mortar dam at inlet

C3C-501



Mortar dam at inlet



Mortar dam at inlet

Location:	Distel Dr.			
Map sheet:	C3			
Date:	1/26/2010			
Weather:	Light rain			
Location code:	Light highway (rural streets, residential neighborhood and parking areas)			
Surface type:	Concrete pavement			
Rim-invert:	2.4 ft.			
Diameter/size:	36x36 in.			
Cover/grate size:	29x37 in.			
Sediment:				
Pipe connections:	Pipe (Direction) Diameter Material			

**Rim-invert** Pipe (Direction) Diameter Material Outlet 12 in. Concrete 1

VANDA rating (structure):



# Item 11 - Distel Dr.

## C3C-501

VANDA rating (pipes):

Notes:

Cracks in downstream pipe?

Recommendations:



Area view



Inlet grating



Area view



Catch basin



# Item 11 - Distel Dr.

## C3C-501



Downstream pipe with cracks



# Item 12 - Loma Prieta Ct.

#### H5F-404

Location:	Loma Prie	eta Ct.			
Map sheet:	H5				
Date:	1/20/2010	)			
Weather:	Light rain				
Location code:	Light high	way (rural st	treets, residentia	al neighborhood and parking	j areas)
Surface type:	Concrete	pavement			
Rim-invert:	1.1 ft.				
Diameter/size:	24x24 in.				
Cover/grate size:	17x25 in.				
Sediment:					
Pipe connections:	Pipe	(Direction)	Diameter	Material	Rim-invert
	Outle	et	10 in.	Concrete	
VANDA rating (str	ructure):	1			

VANDA rating (pipes):

#### Notes:

Inlet higher than surrounding area, resulting in puddling.

1



Ponding near curb inlet due to inlet elevation



Ponding around curb inlet due to inlet elevation

#### H5F-404



Ponding near curb inlet due to inlet elevation



Ponding due to inlet elevation



Curb inlet



Ponding near curb inlet due to inlet elevation



Ponding around inlet due to inlet elevation



Inlet grating



#### H5F-404



Downstream pipe



Flooded cleanout adjacent to curb inlet



Outlet



Ponding around curb inlet due to inlet elevation



#### **General Observations**



Hale Creek, looking upstream



Hale Creek undercrossing

#### F4F-212

Location:	95 Sunshine Dr.		
Map sheet:	1		
Date:	10/2010		
Weather:	ſy		
Location code:	ght highway (rural streets, re	sidential neighborhood and parking areas)	
Surface type:	sphalt		
Rim-invert:	2.6 ft.		
Diameter/size:			
Cover/grate size:	3 in. square		
Sediment:	alf full of sediment		
Pipe connections:	Pipe (Direction) Diame	eter Material	

e connections:Pipe (Direction)DiameterMaterialRim-invertOutlet12 in.Corrugated metal

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Corrugated metal pipe protrudes into catch basin; pipe is half full of sandy sediment.

Recommendations:

Cut pipe to make it flush with outlet wall and remove sediment.

1



## F4F-212



Area view



Catch basin with protruding outlet pipe providing obstruction for debris



Inlet grating



Protruding outlet pipe



Downstream pipe, half-full with debris

## F4F-210

Location: 794 Sunshine Dr.

Map sheet: F4

A&V

# Item 13 - Sunshine Dr.

## F4F-210

Date:	2/10/2010
Weather:	Dry
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Asphalt
Rim-invert:	6 ft.
Diameter/size:	
Cover/grate size:	35x41 in.
Sediment:	

Pipe connections:	Pipe (Direction)	Diameter	Material	Rim-invert
	Inlet	24 in.	Concrete	
	Outlet	27 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

## Recommendations:



1

Inlet grating

#### F4F-207

Location:	741 Sunshine Dr.
Map sheet:	F4
Date:	2/10/2010
Weather:	Dry
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Asphalt
Rim-invert:	1.2 ft.



## Item 13 - Sunshine Dr.

#### F4F-207

Diameter/size:

Cover/grate size: 38 in. square

Sediment:

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Outlet	12 in.		

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Very shallow; appears to be more recent construction.

1

Recommendations:



Area view

#### F4F-208

Location:	740 Sunshine Dr.
Map sheet:	F4
Date:	2/10/2010
Weather:	Dry
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Asphalt
Rim-invert:	
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	
VANDA rating (str	ructure): 1
VANDA rating (pip	bes):



#### F4F-208

Notes:

#### **Recommendations:**



#### Area view

#### F4F-201

Leasting	705 Quashias Da			
Location:	735 Sunsnine Dr.			
Map sheet:	F4			
Date:	2/10/2010			
Weather:	Dry			
Location code:	Light highway (rural st	treets, residentia	al neighborhood and parking areas)	
Surface type:	Asphalt			
Rim-invert:	1 ft.			
Diameter/size:				
Cover/grate size:	12x 20 in.			
Sediment:	Half full of sediment			
Pipe connections:	Pipe (Direction)	Diameter	Material	Rim-invert
	Outlet	8 in.	Corrugated metal	
VANDA rating (str	ucture): 1			

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Very shallow; small grating pipe is half full with sediment.

**Recommendations:** 

Replace line and catch basin.



## F4F-201



Area view in driveway of 735 Sunshine Dr.



Poorly constructed outlet



Inlet grating



Outlet pipe, half-full with sediment



Adjacent property (735 Sunshine Dr.) with sandbags lining garage

## F4F-204

Location: 732 Sunshine Dr.

Map sheet: F4

SV&A

## Item 13 - Sunshine Dr.

#### F4F-204

Date:	2/10/2010			
Weather:	Dry			
Location code:	Light highway (rural s	treets, residentia	al neighborhood and parking areas)	
Surface type:	Asphalt			
Rim-invert:	1.2 ft.			
Diameter/size:				
Cover/grate size:	35x 41 in.			
Sediment:	Half full of sediment			
Pipe connections:	Pipe (Direction)	Diameter	Material	Rim-inve
	Outlet	12 in.	Concrete	
VANDA rating (str	ucture): 1			

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Very shallow; pipe is half full with sediment; pipe makes a bend towards the upstream direction of the channel.



Area view showing proximity to Hale Creek undercrossing



Catch basin half-full with sediment



## F4F-204



Outlet facing upstream into Hale Creek



## Item 14 - Ranchita at Julie

#### J6C-225

Location:	Ranchita Dr. & Julie Ln.
Map sheet:	J6
Date:	1/19/2010
Weather:	Light rain
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Concrete pavement
Rim-invert:	2.0 ft.
Diameter/size:	17x24 in.
Cover/grate size:	17x25 in.
Sediment:	
Pipe connections:	Pipe (Direction) Diameter Material

Pipe (Direction)	Diameter	Material	Rim-invert
Outlet	12 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

No sump, but rear of chamber catches leaves and debris; cover sits proud of frame; resident says he cleans catch basins in area and that Ranchita Dr. floods to the east.

**Recommendations:** 



1

Area view



Curb inlet



#### J6C-225



Catch basin with debris



Outlet

#### J6C-226

Location:	Ranchita Dr. & Ranchita Ct.					
Map sheet:	J6					
Date:	1/19	9/2010				
Weather:	Ligh	nt rain				
Location code:	Ligh	nt highway (rural st	treets, residentia	al neighborho	od and parking areas)	
Surface type:	Cor	crete pavement				
Rim-invert:	4.2 ft.					
Diameter/size:	26x	29 in.				
Cover/grate size:	23x	25 in.				
Sediment:	Nor	e				
Pipe connections:	:	Pipe (Direction)	Diameter		Material	Rim-invert
		Inlet A	24 in.	Concrete		
		Inlet B	12 in.	Concrete		
		Outlet	24 in.	Concrete		4.2 ft.

VANDA rating (structure):

1

1

VANDA rating (pipes):

Notes:



#### J6C-226



Area view looking west



Curb inlet and grating



Inlet

#### J6C-227

Location: Ranchita Dr. & Ranchita Ct. Map sheet: J6



Plan view



Outlet

## Item 14 - Ranchita at Julie

## J6C-227

Date:	1/19	9/2010			
Weather:	Ligh	it rain			
Location code:	Ligh	it highway (rural st	treets, residentia	al neighborhood and parking areas)	
Surface type:	Con	crete pavement			
Rim-invert:	4.2	ft.			
Diameter/size:	24x2	29 in.			
Cover/grate size:	23x2	25 in.			
Sediment:	Non	e			
Pipe connections:	:	Pipe (Direction)	Diameter	Material	Rim-invert
		Inlet	24 in.	Concrete	
		Outlet	24 in.	Concrete	
VANDA rating (structure): 1					

VANDA rating (pipes):

Notes:

#### Recommendations:



1

Plan view



Curb inlet



# Item 14 - Ranchita at Julie

## J6C-227



Inlet

#### J6F-228

Location:	Ranchita Ct. near Ranchita Dr.			
Map sheet:	J6			
Date:	1/19/2010			
Weather:	Light rain			
Location code:	Easement/Right of way			
Surface type:				
Rim-invert:				
Diameter/size:				
Cover/grate size:				
Sediment:				
Pipe connections:				
VANDA rating (str	ructure):			
VANDA rating (pip	pes):			
Notes:				
Could not locate	e in bushes on street side of fence.			
Recommendations:				

CCTV to locate.



## **General Observations**



Area view at Cherry Ave. & Coronado Ave.

#### D2F-402

Location:	Cherry Ave. & Sylvian Way
Map sheet:	D2
Date:	1/26/2010
Weather:	Light rain
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Concrete pavement
Rim-invert:	
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	
VANDA rating (str	ucture):
VANDA rating (pip	bes):
Notes:	



# Item 15 - Cherry Ave.

## D2F-402







Catch basin with debris

#### D2F-401

Location:	Cherry Ave. & Sylvian Way
Map sheet:	D2
Date:	1/26/2010
Weather:	Light rain
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Concrete pavement
Rim-invert:	
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	
VANDA rating (str	ucture):
VANDA rating (pip	bes):
Notes:	



#### D2F-401



Area view

#### D2D-403

Location:	Cherry Ave. & Sylvian Way
Map sheet:	D2
Date:	1/26/2010
Weather:	Light rain
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Asphalt
Rim-invert:	
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	
VANDA rating (str	ucture):
VANDA rating (pip	bes):
Notes:	



## D2D-403



Area view showing proximity of D2D-403 and D2D-404



Plan view



South inlet

#### D2D-404



West outlet

Location:	Cherry Ave. & Sylvian Way	
Map sheet:	D2	
Date:	1/26/2010	
Weather:	Light rain	
Location code:	Light highway (rural streets, residential neighborhood and parking areas)	
Surface type:	Asphalt	
Rim-invert:		
Diameter/size:		
Cover/grate size:		
Sediment:		
Pipe connections:		
VANDA rating (structure):		
VANDA rating (pipes):		



#### D2D-404

Notes:



Area view



Plan view



North barrel wall





Area view showing proximity of D2D-404 and D2D-403



East inlet



South barrel wall

# Item 15 - Cherry Ave.

# D2D-404

## D2D-423

Location:	Cherry Ave. & Coronado Ave.	
Map sheet:	D2	
Date:	1/26/2010	
Weather:	Light rain	
Location code:	Light highway (rural streets, residential neighborhood and parking areas)	
Surface type:	Asphalt	
Rim-invert:		
Diameter/size:		
Cover/grate size:		
Sediment:		
Pipe connections:		
VANDA rating (structure):		
VANDA rating (pipes):		
Notes:		

**Recommendations:** 



Plan view



Drop inlet



# Item 15 - Cherry Ave.

## D2D-423



Barrel walls

#### D2D-421

Location:	Cherry Ave. & Coronado Ave.	
Map sheet:	D2	
Date:	1/26/2010	
Weather:	Light rain	
Location code:	Light highway (rural streets, residential neighborhood and parking areas)	
Surface type:	Asphalt	
Rim-invert:		
Diameter/size:		
Cover/grate size:		
Sediment:		
Pipe connections:		
VANDA rating (structure):		
VANDA rating (pipes):		
Notes:		



## D2D-421



Plan view



Inlets



Inlets


**Rim-invert** 

#### C3D-102

Location:	Portola	i Ct. & Delphi C	Sir.		
Map sheet:	C3				
Date:	1/26/20	010			
Weather:	Light ra	ain			
Location code:	Light hi	ighway (rural st	reets, residentia	al neighborhood and parking areas)	
Surface type:	Asphal	t			
Rim-invert:	5.7 ft.				
Diameter/size:					
Cover/grate size:					
Sediment:					
Pipe connections:	Pi	pe (Direction)	Diameter	Material	
	In	let A	12 in.	Concrete	

12 in.

12 in.

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Inlet from C3C-103 and outlet have about 1 inch of gravel/rocks; inlet from C3C-104 has 1 inch of soft sediment; inlet from C3C-103 enters manhole facing upstream.

Concrete

Concrete

**Recommendations:** 



Inlet B

Outlet

1 1

Plan view



Outlet with gravel/rocks



#### C3D-102

C3C-103



Inlet from C3C-103



Inlet from C3C-104

Location:	Portola Ct. & Delphi Cir.			
Map sheet:	C3			
Date:	1/26/2010			
Weather:	Light rain			
Location code:	Light highway (rural streets, residential neighborhood and parking areas)			
Surface type:	Concrete pavement			
Rim-invert:	4.4 ft.			
Diameter/size:	36x36 in.			
Cover/grate size:	23x40 in.			
Sediment:				
Pipe connections:	Pipe (Direction) Diameter Material			

IS:	Pipe (Direction)	Diameter	Material	<b>Rim-invert</b>
	Outlet	12 in.	Concrete	
structu	re): 1			·

VANDA rating (structure): VANDA rating (pipes):

1

Notes:



## C3C-103



Area view looking southwest



Curb inlet and grating



Outlet transition

### C3C-104

Location: Por

Portola Ct. & Delphi Cir. C3



Area view showing proximity to C3D-102



Catch basin



Downstream pipe



Map sheet:

# Item 16 - Portola Ct. and Delphi Cir.

## C3C-104

Date:	1/26	6/2010			
Weather:	Ligh	nt rain			
Location code:	Ligh	nt highway (rural st	reets, residentia	al neighborhood and parking areas)	
Surface type:	Con	crete pavement			
Rim-invert:	4.1	ft.			
Diameter/size:	36x	36 in.			
Cover/grate size:	23x	40 in.			
Sediment:	3 in	. (hard/concrete)			
Pipe connections:		Pipe (Direction)	Diameter	Material	Rim-inve
		Outlet	12 in.	Concrete	
VANDA rating (structure): 1					

VANDA rating (pipes):

Notes:

Rim-invert measured to hard sediment/concrete in outlet.

1

Recommendations:



Area view



Curb inlet and grating



#### C3C-104



Curb inlet and grating



Outlet transition



Downstream pipe



Catch basin with flow backed up



Downstream pipe



Downstream pipe



Location:	Summerhill Ave. & S. El Monte Ave.
Map sheet:	H2
Date:	1/20/2010
Weather:	Light rain
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic
Surface type:	Concrete pavement
Rim-invert:	3.2 ft.
Diameter/size:	24x36 in.
Cover/grate size:	24 in.
Sediment:	

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet	15 in.	Corrugated metal	
Outlet	12 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Gutter inlet separated from catch basin by short length of corrugated pipe; catch basin has standard manhole cover.

**Recommendations:** 



1 1

Area view with evidence of ponding at east corner of intersection



Curb inlet





Interior view of curb inlet



Plan view of catch basin offset from curb inlet



Downstream pipe

### H2C-218

Location:	Summerhill Ave. & S. El Monte Ave.					
Map sheet:	H2					
Date:	1/20/2010					
Weather:	Light rain					
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic					
Surface type:	Concrete pavement					
Rim-invert:						
Diameter/size:						
Cover/grate size:	Cover/grate size:					
Sediment:						
Pipe connections:						
VANDA rating (structure):						
VANDA rating (pipes):						



## Notes:

Did not open; unknown outlet direction.

**Recommendations:** 







Curb inlet and evidence of overflow/backup



Evidence of ponding at east corner of intersection

#### H2C-217

Location:	Summerhill Ave. & S. El Monte Ave.
Map sheet:	H2
Date:	1/20/2010
Weather:	Light rain
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic
Surface type:	Concrete pavement
Rim-invert:	3.8 ft.
Diameter/size:	24x36 in.
Cover/grate size:	24x41 in.



Sediment: 1 in.					
Pipe connections:	Pipe (Direction)	Diameter	Material	Rim-invert	
	Outlet	15 in.			
VANDA rating (structure): 1					

VANDA rating (pipes):

Notes:

Does not receive flow from H2C-218; receives flow from both Summerhill and El Monte, but both gutters have low slopes which form puddles on either side of catch basin.

**Recommendations:** 



1

Area view with ponding due to shallow slope



Curb inlet



Curb inlet during light rain



Outlet





Inlet from northeast



Ponding along El Monte to southwest due to shallow slope



Catch basin wall surface



Ponding at south corner of intersection

## H2C-216

Location:	Summerhill Ave. & S. El Monte Ave.					
Map sheet:	H2					
Date:	1/20/2010					
Weather:	Light rain					
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic					
Surface type:	Asphalt					
Rim-invert:						
Diameter/size:						
Cover/grate size:	Cover/grate size:					
Sediment:						
Pipe connections:						
VANDA rating (structure):						
VANDA rating (pipes):						



Notes:

Did not open.

Recommendations:



Area view

Curb inlet and grating

## H2D-217

Location:	Summerhill Ave. & S. El Monte Ave.
Map sheet:	H2
Date:	2/2/2010
Weather:	Dry
Location code:	Main highway - Urban thoroughfare, 4 lane street, heavy traffic
Surface type:	Asphalt
Rim-invert:	6.3 ft.
Diameter/size:	
Cover/grate size:	
Sediment:	

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet A (SE)	12 in.	Concrete	
Inlet B (W)	12 in.	Concrete	
Outlet (SW)	15 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Line from H2C-216 may be partially collapsed upstream.

1



#### H2D-217



Plan view



Pipe defect between H2C-216 and H2D-217 with obstruction at invert



Downstream pipe



Inlet from southeast



Pipe defect between H2C-216 and H2D-217



Pipe defect between H2C-216 and H2D-217



#### **General Observations**



Slight ponding on north side of Paula Ct.

#### **I6F-4**01

Location:	Pau	la Ct. at Grant Rd				
Map sheet:	16					
Date:	1/19	9/2010				
Weather:	Ligh	it rain				
Location code:	Ligh	it highway (rural st	treets, residentia	al neighborhood and parking areas)		
Surface type:	Con	crete pavement				
Rim-invert:	5.7	ft.				
Diameter/size:	35x	35 in.				
Cover/grate size:	23x41 in.					
Sediment:	3-4	3-4 in.				
Pipe connections:	:	Pipe (Direction)	Diameter	Material	Rim	
		Inlet	12 in.	Concrete	5.7 ft.	

21 in.

Concrete

VANDA rating (structure): 1

VANDA rating (pipes):

Notes:

Susceptible to cover by debris (palm leaves)

**Recommendations:** 



**Rim-invert** 

7.1 ft.

#### **I6F-4**01



Area view showing debris from palm trees



Inlet grating



Downstream wall

#### 16D-402

Location:

Grant Rd. at Paula Ct.

Map sheet:

16





Debris from palm trees near inlet



Plan view



Outlet transition

**Rim-invert** 

### *I6D-402*

Date:	1/19	1/19/2010				
Weather:	Ligh	nt rain				
Location code:	Ligh	nt highway (rural st	treets, residentia	al neighborhood and parking areas)		
Surface type:	Asp	halt				
Rim-invert:	9.9	ft.				
Diameter/size:	48 i	n.				
Cover/grate size:	24 i	n.				
Sediment:						
Pipe connections:		Pipe (Direction)	Diameter	Material		
		Inlet	24 in.	Concrete		

24 in.

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Precast barrel (32 in. height), cone (eccentric, 36 in. height), chimney (12 in. height); connection to I6F-401 not apparent

Concrete

Recommendations:



Outlet

1

Area view looking north



Area view looking south



## *I6D-402*



Plan view



Downstream pipe



Upstream pipe

## Unknown F (manhole)

Location:	Grant Rd. at Paula Ct.				
Map sheet:	16				
Date:	1/19/2010				
Weather:	Light rain				
Location code:	Light highway (rural streets, residential neighborhood and parking areas)				
Surface type:	Asphalt				
Rim-invert:	10.5 ft.				
Diameter/size:					
Cover/grate size:					
Sediment:					
Pipe connections:					
VANDA rating (str	VANDA rating (structure): 1				
/ANDA rating (pipes):					



## Item 18 - 1270 Grant at Paula Ct.

#### Unknown F (manhole)

Notes:

Not shown on plans (just south of I6D-402); cover labeled for City of Mountain View; definitely connected to I6D-402

Recommendations:



Area view looking north



Area view looking south



Plan view



nvert

# Item 19 - Heritage Ct.

## J5F-301

Location:	Heri	tage Ct.			
Map sheet:	J5				
Date:	1/19	/2010			
Weather:	Ligh	t rain			
Location code:	Ligh	t highway (rural st	treets, residentia	al neighborhood and parking areas)	
Surface type:	Con	crete pavement			
Rim-invert:	2.2 f	ft.			
Diameter/size:	22x2	23 in.			
Cover/grate size:	17x25 in.				
Sediment:	3 in. (grit)				
Pipe connections:		Pipe (Direction)	Diameter	Material	Rim-i
		Outlet	12 in.	Concrete	2.0 ft.

VANDA rating (structure):

VANDA rating (pipes):

#### Notes:

Marked "EL 201.3"; sediment in downstream pipe.

1



Area view



Curb inlet with grating removed

#### J5F-301



Debris in catch basin



Downstream pipe

#### J5F-302

Location:	Heritage Ct.
Map sheet:	J5
Date:	1/19/2010
Weather:	Light rain
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Concrete pavement
Rim-invert:	2.0 ft.
Diameter/size:	23x23 in.
Cover/grate size:	16x25 in.
Sediment:	

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet	12 in.	Concrete	~2.0 ft.
Outlet	12 in.	Concrete	2.0 ft.

VANDA rating (structure):

VANDA rating (pipes):

Notes:

About 2.5 in. of sediment (grit, sand) in upstream and downstream pipes.

1

1



#### J5F-302



Area view



Curb inlet with grating replaced



Downstream pipe with debris backing up flow



Curb inlet with grating removed



Plan view



Upstream pipe



## J5F-302



Upstream pipe transition

#### J5F-303

Location:	Heritage Ct.
Map sheet:	J5
Date:	1/19/2010
Weather:	Light rain
Location code:	Easement/Right of way
Surface type:	
Rim-invert:	
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	
VANDA rating (str	ructure):
VANDA rating (pip	bes):
Notes:	
Could not locate	e; homeowner at 1250 Heritage Ct. indicated its location but no evidence was found.

Recommendations:

CCTV to locate.



# Item 20 - Edge Ln.

## I4D-203

Location:	770 Edge Ln.		
Map sheet:	I4		
Date:	2/10/2010		
Weather:	Dry		
Location code:	Light highway (rural stre	eets, residentia	al neighborhood and parking areas)
Surface type:	Grass/dirt		
Rim-invert:	4.5 ft.		
Diameter/size:	N/A opening		
Cover/grate size:	Concrete lid		
Sediment:			
Pipe connections:	Pipe (Direction)	Diameter	Material

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet	12 in.	Concrete	
Outlet	12 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

This manhole has a heavy concrete lid.

**Recommendations:** 

Replace the concrete lid with a cast iron lid.

1



Area view



Area view



## I4D-203



Plan view



Plan view



Pipe transition

## I4F-202



Concrete cone and cover

Location:	Edge Ln. & Seena Ave.
Map sheet:	14
Date:	2/10/2010
Weather:	Dry
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Asphalt
Rim-invert:	3.76 ft.
Diameter/size:	
Cover/grate size:	38 in. square

Sediment:

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet	12 in.	Concrete	
Outlet	12 in.	Concrete	



## 14F-202

VANDA rating (structure): VANDA rating (pipes): Notes:

Recommendations:



Area view



Area view

Concrete

## I4C-207

Location:	747 Alvina Ct.							
Map sheet:	14	14						
Date:	2/10	2/10/2010						
Weather:	Dry							
Location code:	Ligh	Light highway (rural streets, residential neighborhood and parking areas)						
Surface type:	Asphalt							
Rim-invert:								
Diameter/size:								
Cover/grate size:								
Sediment:								
Pipe connections:	:	Pipe (Direction)	Diameter	Material	Rim-invert			
		Inlet	12 in.	Concrete				

12 in.

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Appears to be fine. Steel screen added to top of catch basin inlet.

Outlet

1



## I4C-207

**Recommendations:** 





Area view

Curb inlet and grating



Plan view

# I4C-208

Location:	743 Alvina Ct.			
Map sheet:	14			
Date:	2/10/2010			
Weather:	Dry			
Location code:	Light highway (rural str	eets, residentia	al neighborhood and parking areas)	
Surface type:	Asphalt			
Rim-invert:				
Diameter/size:				
Cover/grate size:				
Sediment:				
Pipe connections:	Pipe (Direction)	Diameter	Material	Rim-invert
	· · · · ·			



## I4C-208

Pipe (Direction)	Diameter	Material	Rim-invert
Outlet	12 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Slight debris.

Recommendations:



Area view



Plan view showing minor debris



Curb inlet and grating



## Item 21 - 1640 Dallas Ct.

#### K6F-225

Map sheet: K6

Date: 1/19/2010

Weather: Light rain

Location code: Light highway (rural streets, residential neighborhood and parking areas)

Surface type: Asphalt

Rim-invert:

Diameter/size:

Cover/grate size:

Sediment:

Pipe connections:

VANDA rating (structure):

VANDA rating (pipes):

Notes:

At least 18 in. of soft debris; may be abandoned.



Grating removed; structure full of soft debris to at least 18 inches



Grating removed; structure full of soft debris to at least 18 inches



# Item 22 - 1975 Grant at Woodland Library

### L6F-117

Location:	197	5 Grant Rd.				
Map sheet:	L6					
Date:	1/19	9/2010				
Weather:	Ligh	it rain				
Location code:	Side	ewalk				
Surface type:	Con	crete pavement				
Rim-invert:	4.2	4.2 ft.				
Diameter/size:	36x	36x36 in.				
Cover/grate size:	38x	38x38 in.				
Sediment:	1 in					
Pipe connections:		Pipe (Direction)	Diameter	Mat	terial	Rim-invert
		Inlet A	18 in.	Concrete		
		Inlet B	12 in.	Concrete		
		Outlet	18 in.	Concrete		

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Inlet A drains Foothill Expressway; Inlet B from library parking lot; outlet runs SE on Grant Rd.



Cover removed



Catch basin



## L6F-117



Outlet

### Unknown M

Location:	Foothill Expwy. at 1975 Grant Rd.
Map sheet:	L6
Date:	2/2/2010
Weather:	Dry
Location code:	Interstate highway, limited access artery
Surface type:	Grass/dirt
Rim-invert:	
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections	:
VANDA rating (st	ructure):
VANDA rating (pi	pes):
Notes:	
Flows to L6F-1	17 from expressway median; susceptible to burial; did not open.

Inlet



#### **General Observations**



Drainage ditch along Interstate 280



Drainage ditch along Interstate 280, looking west



Catch basin near Interstate 280, covered with leaves



Culvert inlet along Interstate 280 susceptible to burial



Ponding around water tanks



Catch basin near Interstate 280, covered with leaves



#### **General Observations**



Catch basin near Interstate 280, covered with leaves



Catch basin near Interstate 280



Catch basin near Interstate 280



Catch basin near Interstate 280, covered with leaves



Cleanout



Cleanout



#### Unknown A (manhole)

Location:	Eas	ement east of Krir	ng Way			
Map sheet:	N6					
Date:	1/20	)/2010				
Weather:	Hea	ivy rain				
Location code:	Eas	ement/Right of wa	ıy			
Surface type:	Asp	halt				
Rim-invert:	3.8	3.8 ft.				
Diameter/size:						
Cover/grate size:						
Sediment:	Nor	e				
Pipe connections:	:	Pipe (Direction)	Diameter		Material	Rim-invert
		Inlet A (S)	12 in.	Concrete		
		Inlet B (W)	12 in.	Concrete		
		Outlet (N)	15 in.	Concrete		

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Downstream of N6D-602; high-velocity flow from steep slope splashes against wall at 90-degree bend to outlet; very turbulent.

Recommendations:



1

1

Area view



Plan view showing turbulence



## Unknown A (manhole)



Turbulence at outlet due to abrupt change in direction



Downstream pipe

## Unknown B (inlet)

Location:	Easement east of Kring Way			
Map sheet:	N6			
Date:	1/20/2010			
Weather:	Heavy rain			
Location code:	Easement/Right of way			
Surface type:	Concrete pavement			
Rim-invert:				
Diameter/size:				
Cover/grate size:				
Sediment:				
Pipe connections:				
VANDA rating (structure):				
VANDA rating (pipes):				



Upstream pipe from west



Upstream pipe from south



#### Unknown B (inlet)

Notes:

Downstream of Unknown A; sheet flow along easement does not enter catch basin due to cross-slope and berm.

Recommendations:



Grating showing susceptibility to plugging

#### Unknown C (manhole)

Location:	Easement east of Kring Way
Map sheet:	N6
Date:	1/20/2010
Weather:	Heavy rain
Location code:	Easement/Right of way
Surface type:	Grass/dirt
Rim-invert:	5.7 ft.
Diameter/size:	

Cover/grate size:

Sediment:

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet	15 in.	Concrete	
Outlet	15 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Downstream of Unknown B; debris in upstream pipe.

1

1



## Unknown C (manhole)



Area view looking north



Plan view



Area view looking south



Downstream pipe



Debris in upstream pipe

## Unknown D (manhole)

Location: Easement east of Kring Way

N6

Map sheet:

SV&A

## Unknown D (manhole)

Date:	1/20/2010
Weather:	Heavy rain
Location code:	Easement/Right of way
Surface type:	Grass/dirt
Rim-invert:	6.3 ft.

Diameter/size:

Sediment:

Cover/grate size:

None

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet A (S)	15 in.	Concrete	
Inlet B (SW)	12 in.	Concrete	
Outlet (N)	15 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes): 1

Notes:

Downstream of Unknown C.

Recommendations:



1

Area view



Plan view


## Unknown D (manhole)



Downstream pipe



Upstream pipe from south



Upstream pipe from south



Inlet from west



Pipe transition

## Unknown E (inlet)

Location: Easeme Map sheet: N6

Easement east of Kring Way N6



#### Unknown E (inlet)

Date: 1/20/2010

Weather: Heavy rain

Location code: Easement/Right of way

Surface type: Grass/dirt

Rim-invert:

Diameter/size:

Cover/grate size:

Sediment:

Pipe connections:

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Culvert inlet under mound in ditch next to I-280; susceptible to burial by debris; structure not visible (looks more like a hole in the ground).

Recommendations:

Clear/channelize ditch.



#### **General Observations**



Gate in creekbed upstream (south) of 2100 Stonehaven



West side of creekbed in backyard of 2100 Stonehaven



Gate in creekbed upstream (south) of 2100 Stonehaven



Creekbed and storm inlets in backyard of 2100 Stonehaven, looking north



Creekbed and storm inlets in backyard of 2100 Stonehaven, looking north



#### Unknown O

Location:	Trash rack at 2100 Stonehaven
Map sheet:	M5
Date:	2/10/2010
Weather:	Dry
Location code:	Easement/Right of way
Surface type:	Grass/dirt
Rim-invert:	5.0 ft.
Diameter/size:	N/A opening
Cover/grate size:	35x44x25 in. depth trapezoid
Sediment:	

Pipe connections:

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet	N/A	Creek	
Outlet	24 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Resident clears debris from trash rack every storm event.

1

Recommendations:



Trash rack



Downstream pipe



#### Unknown O



Downstream pipe

#### Unknown P

Location:	Trash rack at 2100 Stonehaven
Map sheet:	M5
Date:	2/10/2010
Weather:	Dry
Location code:	Easement/Right of way
Surface type:	Grass/dirt
Rim-invert:	2.3 ft.
Diameter/size:	N/A opening
Cover/grate size:	40x35 in.
Sediment:	

Pipe connections:

5:	Pipe (Direction)	Diameter	Material	Rim-invert
	Inlet	N/A	Creek	
	Outlet	12 in.	HDPE	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Resident added this pipe to handle overflows of creek. The pipe runs parallel to home on driveway and terminates prior to curb.

#### **Recommendations:**

Need to tie in pipe outlet to catch basin M5C-208.

1



#### Unknown P



Storm inlets in backyard of 2100 Stonehaven, looking west



Inlet installed by homeowner

# M5D-216

Location:	2100 Stonehaven (alongside driveway)
Map sheet:	M5
Date:	2/10/2010
Weather:	Dry
Location code:	Easement/Right of way
Surface type:	Grass/dirt
Rim-invert:	11.4 ft.
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	Pipe (Direction) Diameter



Trash rack and inlet (left) built by homeowner near existing trash rack and inlet



Grating over inlet installed by homeowner

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet	24 in.	Concrete	
Outlet	24 in.	Concrete	



1

#### M5D-216

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Manhole just uphill of driveway (not where map shows it to be) takes flow from creek inlet.

**Recommendations:** 



Area view



Area view



Area view looking south



Plan view





Plan view

#### M5F-206

Location:	2110/2120 Stonehaven
Map sheet:	M5
Date:	2/10/2010
Weather:	Dry
Location code:	Light highway (rural streets, residential neighborhood and parking areas)
Surface type:	Asphalt
Rim-invert:	3.6 ft.
Diameter/size:	
Cover/grate size:	
Sediment:	
Pipe connections:	Pipe (Direction) Diameter Material

:	Pipe (Direction)	Diameter	Material	Rim-invert
	Inlet	27 in.	Concrete	
	Outlet	27 in.	Concrete	

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Dual catch basin connected by 12-inch pipe (each catch basin is similar in construction).

1

**Recommendations:** 



#### M5F-206



Area view



North of pair of inlets



Downstream pipe



Curb inlets



South of pair of inlets



Downstream pipe



#### M5F-206



Opening between pair of catch basins

#### M5C-208

Location:	210	0 Sierra Ventura					
Map sheet:	M5	M5					
Date:	2/10	2/10/2010					
Weather:	Dry						
Location code:	Ligh	it highway (rural s	treets, residentia	al neighborhood and parking areas)			
Surface type:	Asp	Asphalt					
Rim-invert:							
Diameter/size:							
Cover/grate size:							
Sediment:							
Pipe connections	:	Pipe (Direction)	Diameter	Material	Rim-invert		
		Outlet	12 in.	Concrete			

VANDA rating (structure):

VANDA rating (pipes):

Notes:

Pipe added by homeowner (12-inch HDPE) from creek terminates under hedges in lawn strip just short of catch basin M5C-208.

Recommendations:

Need to tie in pipe outlet to catch basin M5C-208.

1



#### M5C-208



Area view



Downstream pipe

## M5D-207

Location:	Sier	ra Ventura & Ston	ehaven	
Map sheet:	M5			
Date:	3/9/	2010		
Weather:	Dry			
Location code:	Ligh	nt highway (rural st	reets, residentia	al neighborhood and parking areas)
Surface type:	Asp	halt		
Rim-invert:	2 ft.	& 10 ft		
Diameter/size:	50x	69 in.		
Cover/grate size:	25x	48 in.		
Sediment:				
Pipe connections:		Pipe (Direction)	Diameter	Material



Pipe (Direction)	Diameter	Material	Rim-invert
Inlet A (SE)	21 in.	Concrete	2.0 ft.
Inlet B (S)	12 in.	Concrete	2.0 ft.



Curb inlet and grating

Pipe outlet near catch basin under hedge in front yard of 2100 Stonehaven

1

#### M5D-207

Pipe (Direction)	Diameter	Material	Rim-invert
Inlet C (SW)	24 in.	Concrete	2.0 ft.
Outlet A (NW)	27 in.	Concrete	2.3 ft.
Outlet B (NW)	18 in.	Concrete	10.0 ft.

VANDA rating (structure):

VANDA rating (pipes):

Notes:

See detailed notes; gate structure with two outlets (27-inch primary 18-inch secondary); 10-inch high weir plate on gate adjustment; paved over.

#### **Recommendations:**

Remove asphalt patch and open hatch to exercize gate. Set gate to optimize flow model.



Area view, looking northeast with access hatch outlined in white



Area view looking east



Area view looking west



Street-level view of paved-over access hatch





Northwest outlet



Southeast 21-inch inlet



Southwest 24-inch inlet



Southeast 21-inch inlet



South 12-inch inlet



Top of gate





Top of gate



Gate



Gate operating mechanism



Gate operating mechanism



Gate operating mechanism



Gate operating mechanism





Outlet





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