

***Paradise Valley Watershed Study
Cheney Watershed
Alternatives Analysis Report - Appendices***

Dibble Project No.: 1015079

February 9, 2017

Submitted To:



Appendices

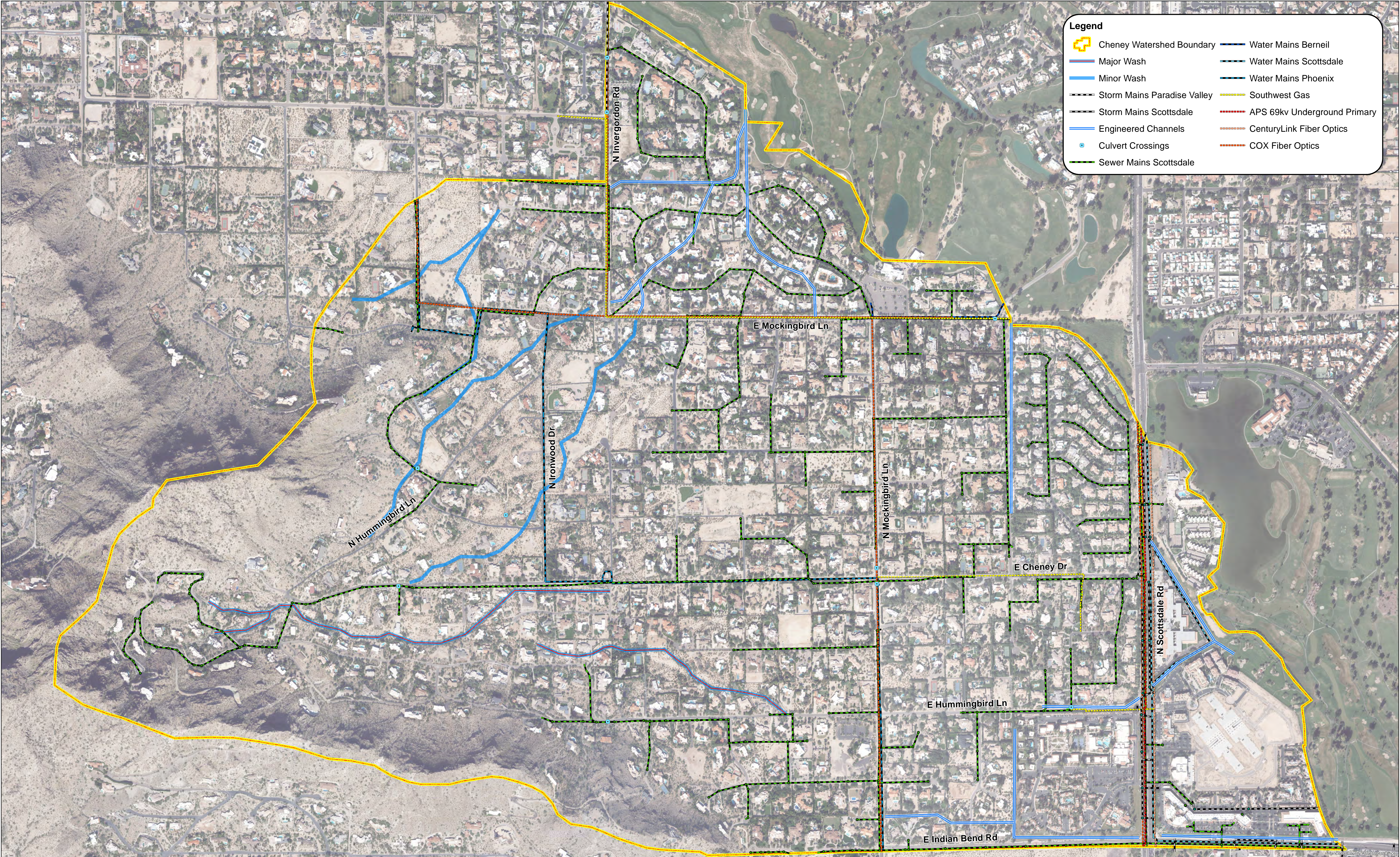
- Appendix A – Existing Facilities & Utilities Map
- Appendix B – Cheney Watershed Preliminary Alternatives (May 2016)
- Appendix C – 100-Year Modeled Alternatives Inundation Maps
- Appendix D – 10-Year Modeled Alternatives Inundation Maps
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- Appendix G – Alternatives Cost Summary
- Appendix H – Evaluation Matrices

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7500 North Dreamy Draw Drive
Suite 200
Phoenix, Arizona 85020
P. 602.957.1155
F. 602.957.2838
www.dibblecorp.com



Appendix A: Existing Facilities & Utilities Map



Legend

	Cheney Watershed Boundary		Water Mains Berneil
	Major Wash		Water Mains Scottsdale
	Minor Wash		Water Mains Phoenix
	Storm Mains Paradise Valley		Southwest Gas
	Storm Mains Scottsdale		APS 69kv Underground Primary
	Engineered Channels		CenturyLink Fiber Optics
	Culvert Crossings		COX Fiber Optics
	Sewer Mains Scottsdale		

Appendix B:

Cheney Watershed Preliminary Alternatives (May 2016)



Cheney Watershed – Preliminary Alternatives

The following preliminary alternatives are presented for Town of Paradise Valley staff for consideration and comment. Alternatives are grouped into Improvement Areas based on interdependence of component elements. Summaries below correspond with associated graphic attachments.

A. Improvement Area: Cheney

A.1 Alternative: Cheney 1

Attachment Keynotes:

1. Underground storm drain from Cheney Drive to Mockingbird Lane – 10-year design storm
2. Bubble-up catch basins along Stallion Drive and possibly Mockingbird Lane
3. Sediment capture basin designed for annual sediment load
4. Low Impact Development improvements within considerable open frontage area
5. Early construction of FCDMC 10-year storm drain system outlet to benefit adjacent properties
6. Channel and culvert improvement at Foothill Drive
7. Underground storm drain in Brahman Road
8. Underground storm drain from 70th Street to Hummingbird Lane
9. Improve existing open channel as necessary for increased storm drain flow

The 66th Street storm drain (Keynote 1) is expected to capture up to the 10-year design storm from the Cheney Improvement Area, benefiting the structures and property east of the proposed alignment. The storm drain alignment passes through public rights-of-way and privately owned parcels; this alignment was chosen as least impactful to private property. The storm drain releases back to Mockingbird Lane at Stallion Drive via a series of bubble-up catch basins. Due to tight residential corridors and the surface release to Mockingbird Lane, a 10-year design storm is expected to be the maximum practical design storm for this system. The FCDMC plans for a 10-year storm drain collection system in Cheney Drive will compliment this system; the combined system is expected to capture a 50-year design storm discharge, benefitting the area east of the 66th Street up to the location of the Stallion Road surface release. North and east of this location will be benefitted only by the FCDMC 10-year collection system.

Keynote Item 5 constructs the FCDMC planned 10-year storm drain mainline and interim catch basin collection system. This mainline could then be extended in the event of the FCDMC system implementation.

The need for Keynote Items 6, 7, and 8 will be determined as part of the modeling of the storm drain trunk line system.



A.2 Alternative: Cheney 2

Attachment Keynotes:

1. Underground storm drain from Cheney Drive to Mockingbird Lane – 10-year design storm
2. Underground storm drain from Stallion Road to Indian Bend Wash – 50-year design storm
3. Sediment capture basin designed for annual sediment load
4. Low Impact Development improvements within considerable open frontage area
5. Channel and culvert improvement at Foothill Drive
6. Underground storm drain in Brahman Road
7. Underground storm drain from 70th Street to Hummingbird Lane
8. Improve existing open channel as necessary for increased storm drain flow

The 66th Street storm drain (Keynote 1) is expected to capture up to the 10-year design storm from the Cheney Improvement Area, benefiting the structures and property east of the proposed alignment. The storm drain alignment passes through public rights-of-way and privately owned parcels; this alignment was chosen as least impactful to private property. The storm drain connects to the Mockingbird Lane trunk line. Due to tight residential corridors, a 10-year design storm is expected to be the maximum practical design storm for this system. The FCDMC plans for a 10-year storm drain collection system in Cheney Drive will compliment this system; the combined system is expected to capture a 50-year design storm discharge, benefitting the area east of the 66th Street. The Mockingbird Lane storm drain (Keynote 2) is an upsizing of the FCDMC proposed facility (preliminary) from a 10-year to a 50-year collection system; the result is a 50-year collection system benefiting nearly all areas in the Cheney Improvement Area. This will very likely require roadway capacity improvements in addition to underground storm drain.

The need for Keynote Items 6, 7, and 8 will be determined as part of the modeling of the storm drain trunk line system.

A.3 Alternative: Cheney 3

Attachment Keynotes:

1. Open channel on south side of Cheney Drive; crosses Mockingbird Lane and Scottsdale Road
2. Sediment capture basin designed for annual sediment load
3. Early construction of FCDMC 10-year storm drain system outlet to benefit adjacent properties
4. Channel and culvert improvement at Foothill Drive
5. Underground storm drain in Brahman Road
6. Underground storm drain from 70th Street to Cheney Drive channel

Preliminary feasibility analysis of a new channel on the south side of Cheney drive suggests a potential capacity of approximately 215 cfs without extensive modification to existing rights-of-way limits, this is between a 5-year and 10-year peak flow for Cheney Wash. The channel requires shifting Cheney Drive to the northern edge of the existing rights-of-way east of Mockingbird Lane. New easements are required in segments both west and east of Mockingbird Lane. At least 3 land owners will require 26' wide easements; and at least 6 land owners will require 6' wide easements. Sidewalk is required



to be relocated east of 70th Street. **Figure 1** and **Figure 2** provide conceptual sections and rough sizing of the channel concepts.

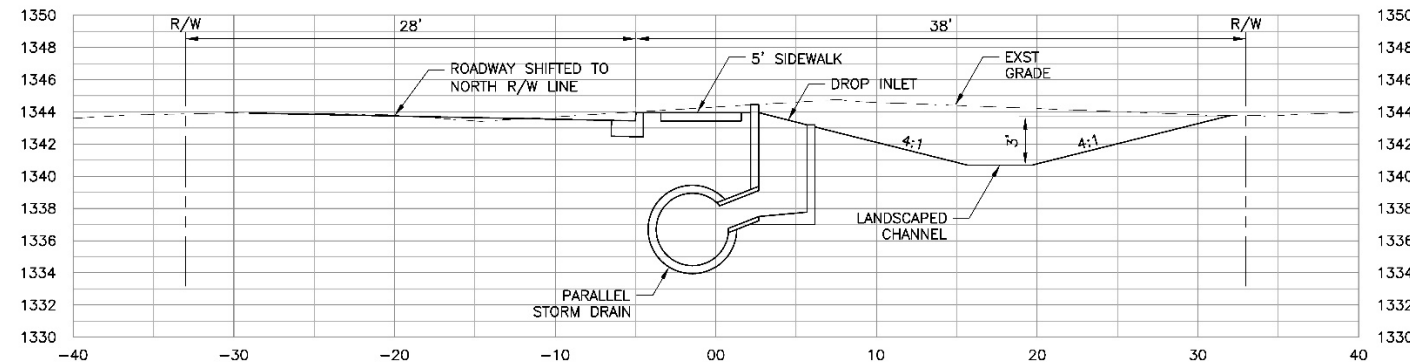


Figure 1 – Cheney Channel Typical Section with Storm Drain Overflow Inlet (Facing East)

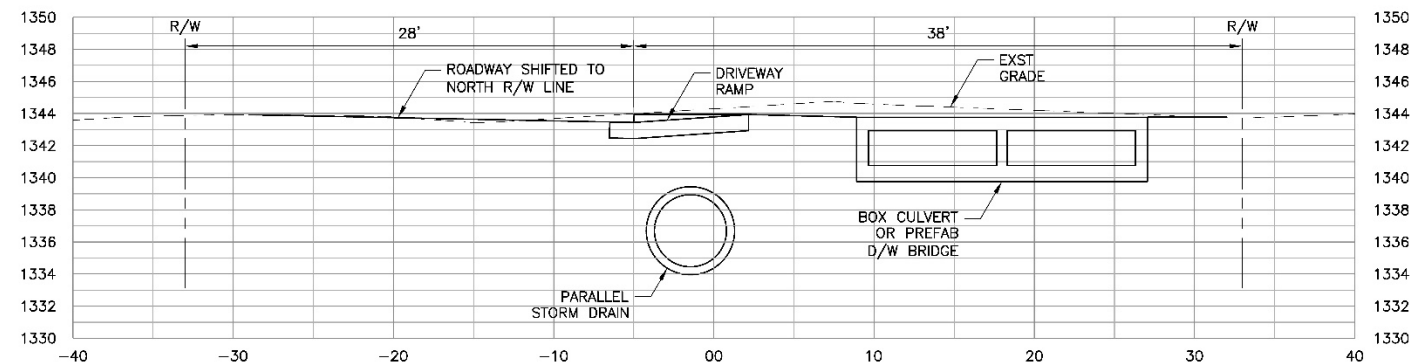


Figure 2 – Cheney Channel Typical Driveway Culvert (Facing East)

This alternative requires a capacity analysis of the existing outfall channel east of Scottsdale Road. The FCDMC plans for a 10-year storm drain collection system in Cheney Drive will compliment this system; the combined system is expected to capture a 50-year design storm discharge, benefitting nearly all areas in the Cheney Improvement Area. The channel could be designed such that low flows remain within the channel, only entering the parallel storm drains systems during large, infrequent events. This will help to reduce storm drain maintenance requirements.

Keynote Item 3 constructs the FCDMC planned 10-year storm drain mainline and interim catch basin collection system. This mainline could then be extended in the event of the FCDMC system implementation.

The need for Keynote Items 4, 5, and 6 will be determined as part of the modeling of the storm drain trunk line system.



B. Improvement Area B: Mockingbird

B.1 Alternative: Mockingbird 1

Attachment Keynotes:

1. Underground storm drain in Hummingbird Lane – 10-year design storm
2. Sediment capture basin designed for annual sediment load
3. Storm water retention on church property – 10-year design storm volume

Mockingbird 1 collects and retains the 10-year design storm, providing protection to downstream properties along Mockingbird Lane and Indian Bend Road. The FCDMC plans for a 10-year storm drain collection system in Mockingbird Lane will compliment this system. If incorporated as an off-line basin into the FCDMC system, the combined system could potentially provide a 50-year collection capacity. This alternative requires discussion with the private land owner and grading analysis of available area to determine the approximate storage capacity.

B.2 Alternative: Mockingbird 2

Attachment Keynotes:

1. Underground storm drain in Hummingbird Lane – 25-year design storm
2. Sediment capture basin designed for annual sediment load
3. Storm water retention on church property – 25-year design storm volume

Mockingbird 2 collects and retains the 25-year design storm, providing protection to downstream properties along Mockingbird Lane and Indian Bend Road. The FCDMC plans for a 10-year storm drain collection system in Mockingbird Lane will compliment this system. If incorporated as an off-line basin into the FCDMC system, the combined system could potentially provide a 100-year collection capacity. This alternative requires discussion with the private land owner and volume analysis of available area to determine the final storage capacity.

B.3 Alternative: Mockingbird 3

Attachment Keynotes:

1. Underground storm drain and existing channel improvements – 10-year design storm
2. Sediment capture basin designed for annual sediment load

Mockingbird 3 provides additional conveyance capacity to an existing channel between several private parcels east of Mockingbird Lane. Existing conditions modeling suggest that the existing channel system on the Scottsdale Plaza Resort property is adequately sized to receive this flow; this alternative does not alter existing flow paths. Channel improvements with a parallel underground storm drain pipe is expected to convey the 10-year storm event peak flow, providing benefit to the properties adjacent to the improvements. The FCDMC plans for a 10-year storm drain collection system in Mockingbird Lane will compliment this system. Together, the system is expected to collect



the 50-year storm runoff for the properties between Mockingbird Lane and the Scottsdale Plaza Resort that are adjacent to the proposed storm drain.

B.4 Alternative: Mockingbird 4

Attachment Keynotes:

1. Underground storm drain and existing channel improvements – 25-year design storm
2. Sediment capture basin designed for annual sediment load

Mockingbird 4 provides additional conveyance capacity to an existing channel between several private parcels east of Mockingbird Lane. Existing conditions modeling suggest that the existing channel system on the Scottsdale Plaza Resort property is adequately sized to receive this flow; this alternative does not alter existing flow paths. Channel improvements with a parallel underground storm drain pipe is expected to convey the 10-year storm event peak flow, providing benefit to the properties adjacent to the improvements. The FCDMC plans for a 10-year storm drain collection system in Mockingbird Lane will compliment this system. Together, the system is expected to collect the 100-year stormwater runoff for the properties between Mockingbird Lane and the Scottsdale Plaza Resort that are adjacent to the proposed storm drain.

C. Improvement Area: Hummingbird

Attachment Keynotes:

1. Sediment collection ditch and underground storm drain – 10-Year, 50-year, and 100-year design storms
2. Alternative to the wash outfall; this option is available if an appropriate alternative has been selected for the Mockingbird Improvement Area.

Alternatives Hummingbird 1, Hummingbird 2, and Hummingbird 3 vary only in design storm return period. Each is intended to collect hillside stormwater and sediment in a parallel ditch system with stormwater inlets elevated above the ditch floor. The ditch system is not continuous though the project; rather, it is segmented between driveways and may be absent where hillside inflows are not expected. The purpose of this is to minimize the potential to alter existing flow paths should the system be overwhelmed. The stormwater collected in the catch basins enters a parallel storm drain system. The storm drain either enters the existing parallel wash, or, if the selected alternative for the Hummingbird Lane Improvement Area includes an appropriately sized storm drain, continues east. **Figure 3** is a conceptual section of the collection system.

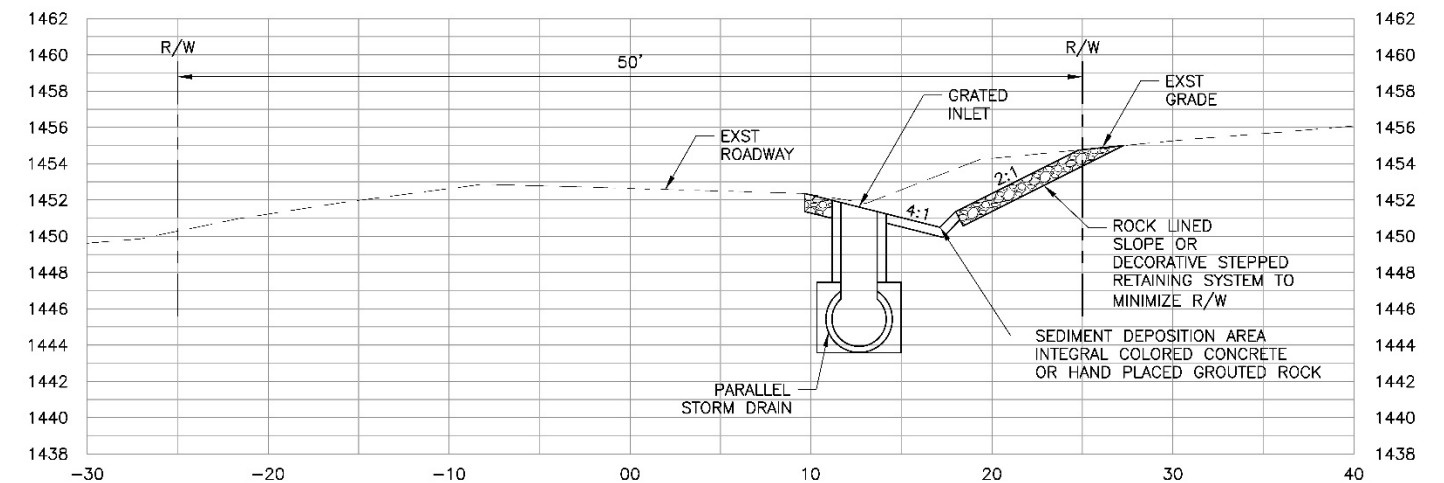


Figure 3 – Hillside Sediment Collection Ditch with Storm Drain Inlet (Faces East)

D. Improvement Area: Quartz Mountain

Attachment Keynotes:

1. Sediment collection ditch and underground storm drain – 10-Year, 50-year, and 100-year design storms
2. Cheney Wash bank protection measures – 100-year design storm

Alternatives Quartz Mountain 1, Quartz Mountain 2, and Quartz Mountain 3 vary only in design storm return period. Each is intended to collect hillside stormwater and sediment in a parallel ditch system with stormwater inlets elevated above the ditch floor. The ditch system is not continuous though the project; rather, it is segmented between driveways and may be absent where hillside inflows are not expected. The purpose of this is to minimize the potential to alter existing flow paths should the system be overwhelmed. The stormwater collected in the catch basins enters a parallel storm drain system. The storm drain enters Cheney Wash. **Figure 3** is a conceptual section of the collection system.

E. Improvement Area: Foothill

Attachment Keynotes:

1. Sediment collection ditch and underground storm drain – 10-Year, 50-year, and 100-year design storms

Alternatives Foothill 1, Foothill 2, and Foothill 3 vary only in design storm return period. Each is intended to collect hillside stormwater and sediment in a parallel ditch system with stormwater inlets elevated above the ditch floor. The ditch system is not continuous though the project; rather, it is segmented between driveways and may be absent where hillside inflows are not expected. The purpose of this is to minimize the potential to alter existing flow paths should the system be overwhelmed. The stormwater collected in the catch basins enters a parallel storm drain system. The storm drain enters the adjacent wash. **Figure 3** is a conceptual section of the collection system.



F. Improvement Area: Maverick

F.1 Alternative: Maverick 1

Attachment Keynotes:

1. Underground storm drain and existing channel improvements – 10-year design storm

Maverick 1 provides additional conveyance capacity to an existing channel between several private parcels with an outfall to Indian Bend Wash. Channel improvements with a parallel underground storm drain pipe are expected to convey the 10-year storm event peak flow, providing benefit to the properties adjacent to the improvements and southeast of the improvements along 68th Street. The FCDMC plans for a 10-year storm drain collection system in Invergordon Road will compliment this system. Together, the system is expected to collect the 50-year stormwater runoff for the properties between Invergordon Road and Indian Bend Wash.

F.2 Alternative: Maverick 2

Attachment Keynotes:

1. Underground storm drain and existing channel improvements – 10-year design storm
2. Underground storm drain in Maverick Road – 50-year design storm
3. Sediment capture basin designed for annual sediment load
4. Underground storm drain in Invergordon Road; connects to existing storm drain – 10-year design storm

Maverick 2 provides additional conveyance capacity to an existing channel between several private parcels with an outfall to Indian Bend Wash. Channel improvements with a parallel underground storm drain pipe are expected to convey the 10-year storm event peak flow, providing benefit to the properties adjacent to the improvements and southeast of the improvements along 68th Street. Further, a new storm drain system in Maverick Road with a 50-year design storm capacity increases the benefit properties along Maverick Road. At the junction with the 10-Year storm drain system (Keynote 1) a split occurs. A 10-year storm drain system then continues in Invergordon road, connecting to the existing system at Mockingbird Lane. The FCDMC currently has preliminary plans for a 10-year storm drain collection system in Maverick Road and Invergordon Road – this project represents an upsizing to that system on Maverick Road and early construction of that system on Invergordon Road between Maverick Road and Mockingbird Lane.



G. Spot Improvements

The following spot improvements do not involve competing alternatives. However, once their benefit is confirmed through analysis, they will be included in the Capital Improvement Plan prioritization.

G.1 Spot Improvement A

Attachment Keynotes:

1. Extend existing 2-barrel 30-inch diameter pipe culvert approximately 400' to south of Mockingbird Lane
2. Sediment capture basin designed for annual sediment load

G.2 Spot Improvement B

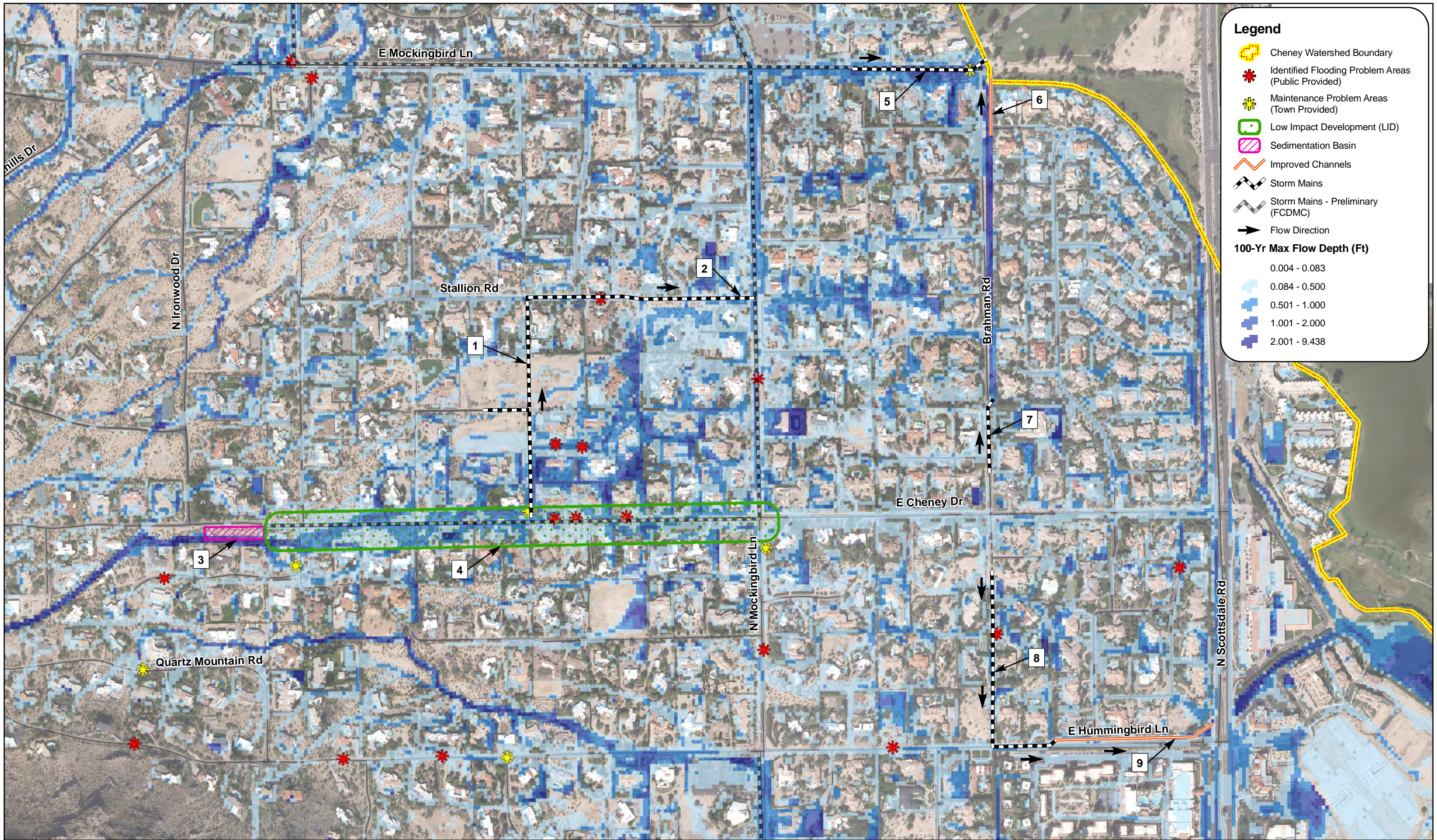
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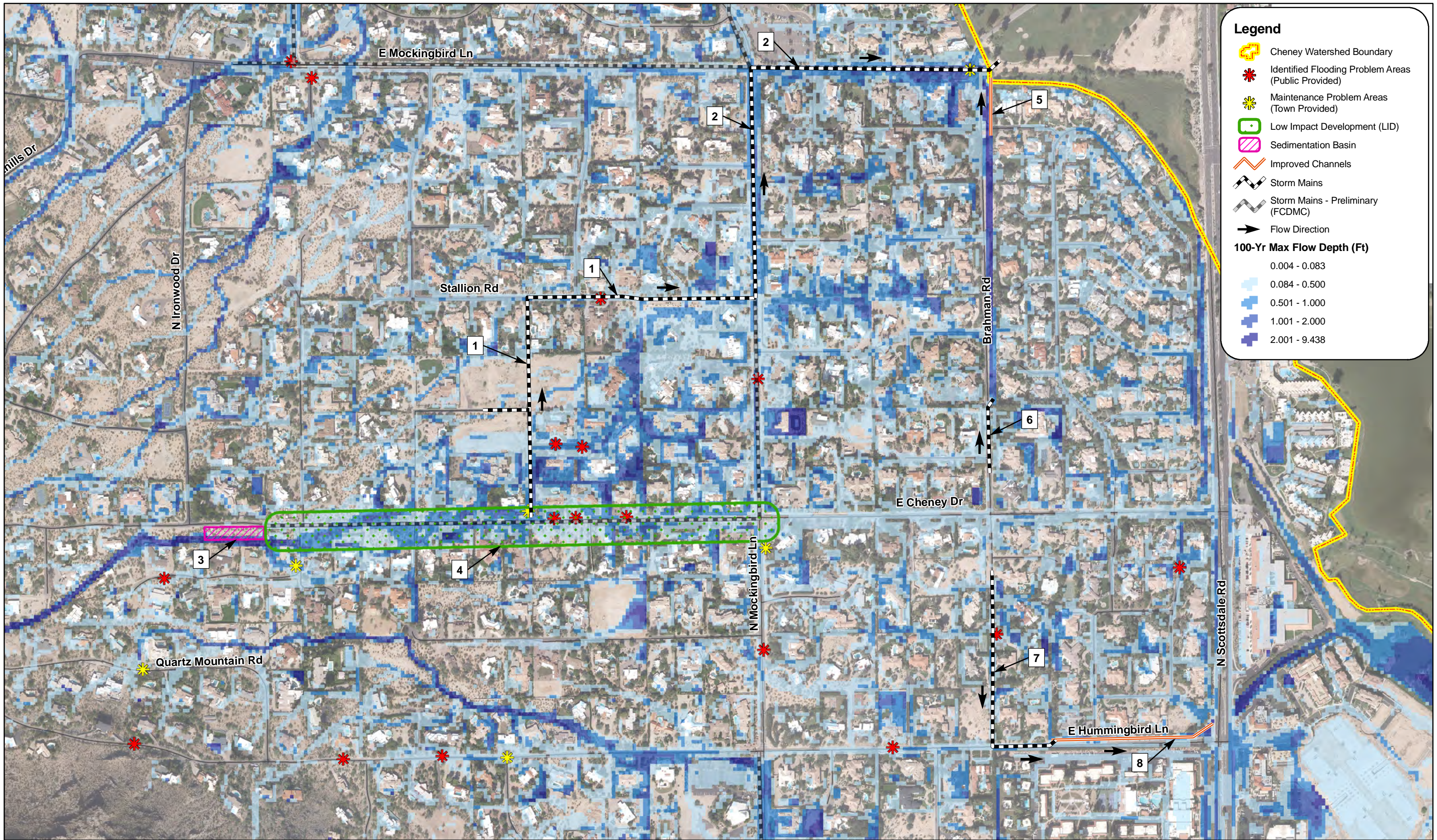
3. Improve existing at-grade crossing to reduce the need for regular maintenance after storm events.
4. Sediment capture basin designed for annual sediment load

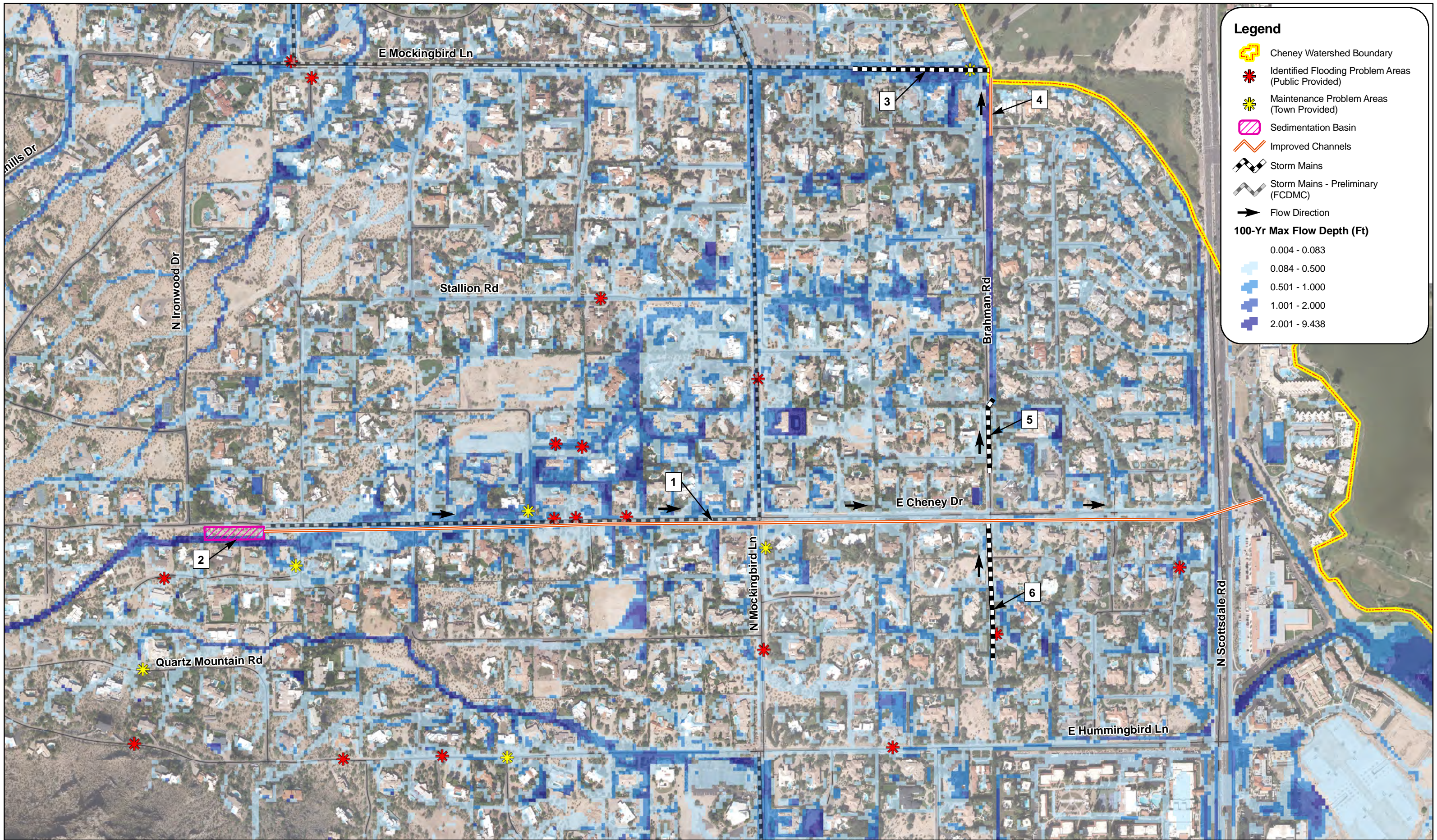
G.3 Spot Improvement C

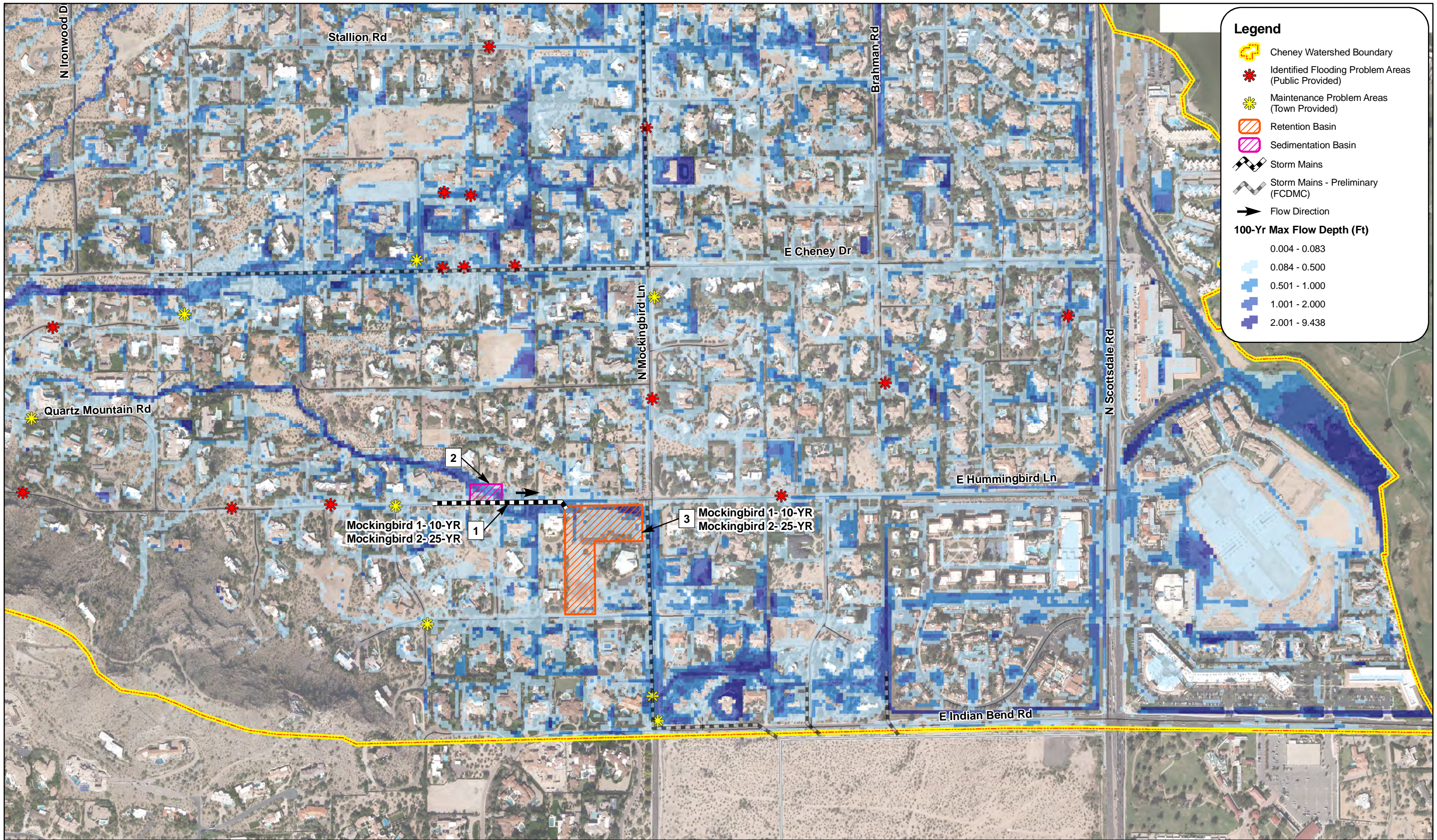
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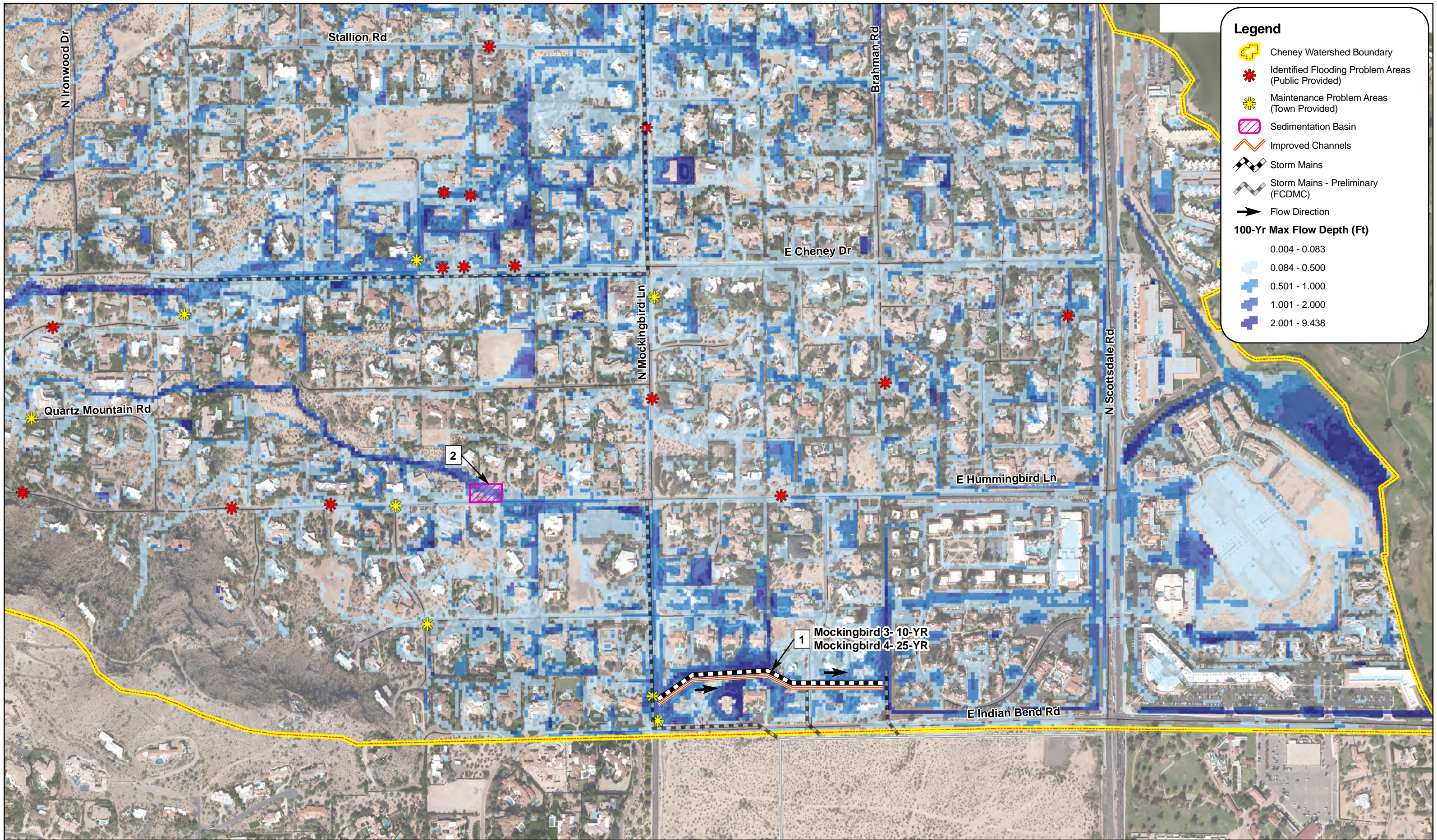
5. Improve existing culvert to provide 100-year conveyance without breakout to private parcel east of Ironwood Drive.

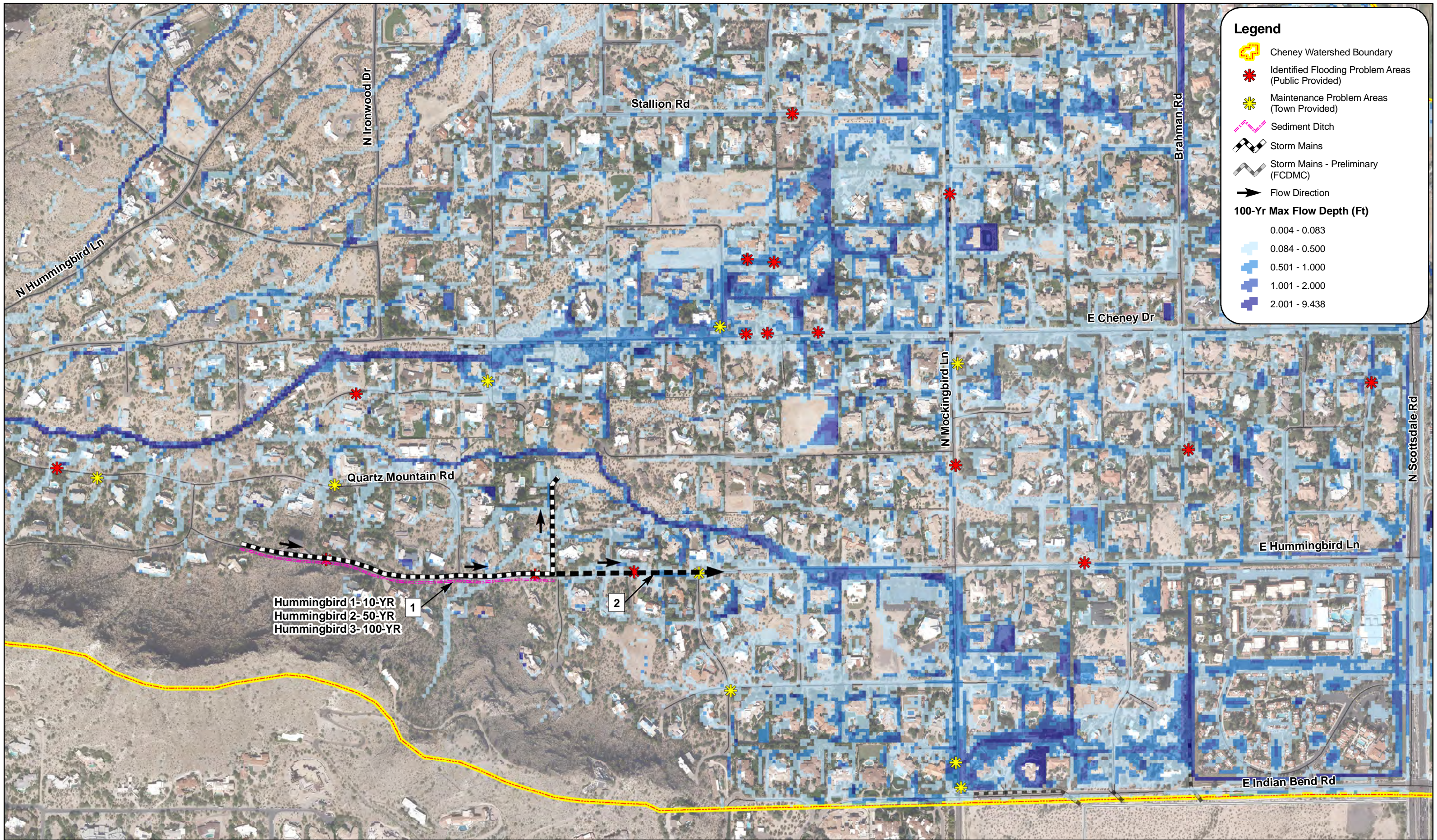












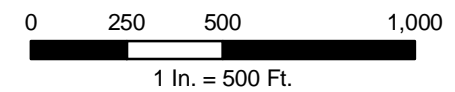


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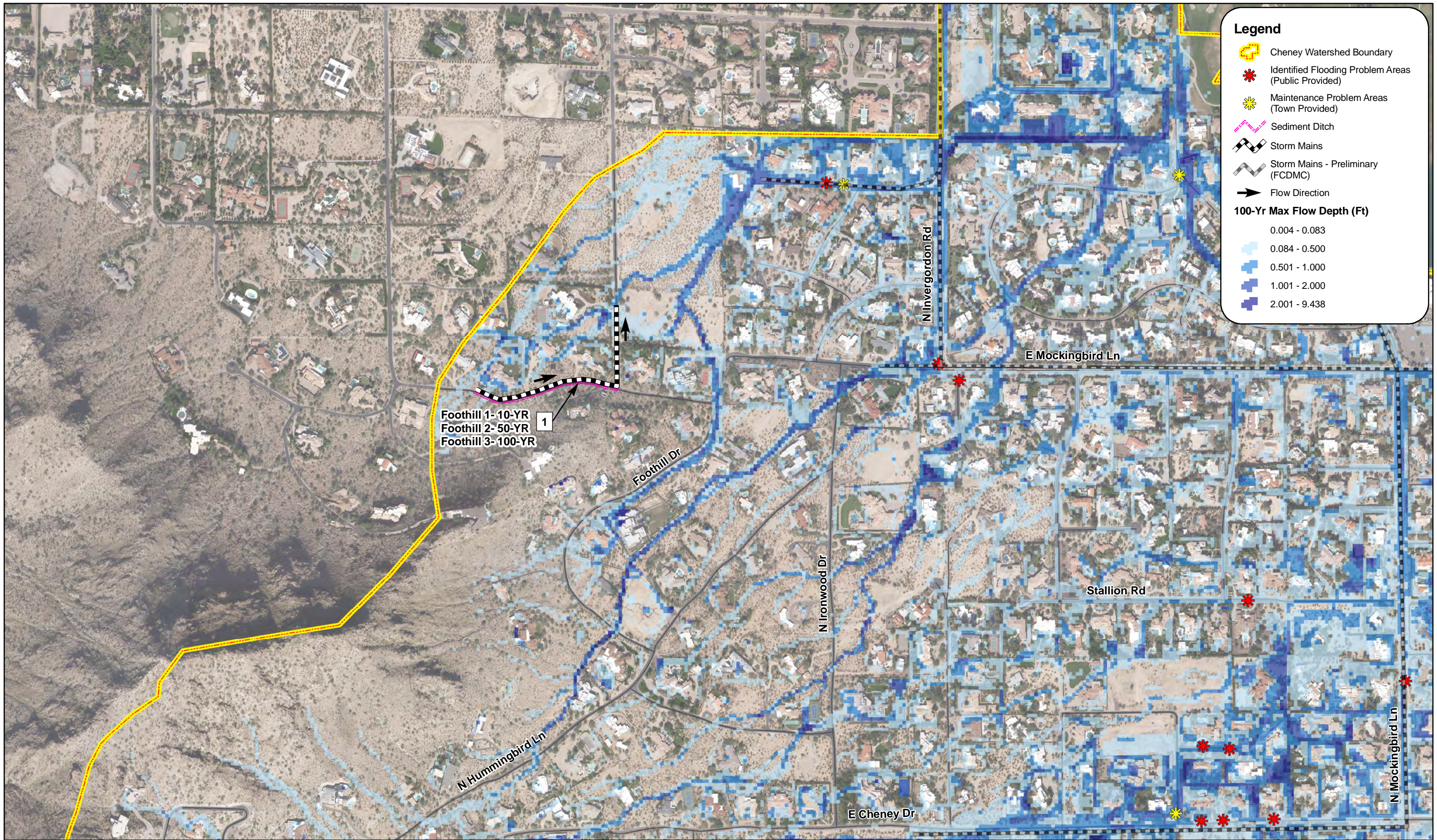
- Cheney Watershed Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sediment Ditch
- Embankment Protection
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
- 100-Yr Max Flow Depth (Ft)**
 - 0.004 - 0.083
 - 0.084 - 0.500
 - 0.501 - 1.000
 - 1.001 - 2.000
 - 2.001 - 9.438

Quartz Mountain 1- 10-YR
Quartz Mountain 2- 50-YR
Quartz Mountain 3- 100-YR

**Quartz Mountain Improvement Area
Alternative: Quartz Mountain 1, 2 & 3**



PARADISE VALLEY WATERSHED STUDIES
CHENEY WATERSHED
PRELIMINARY ALTERNATIVES



Legend

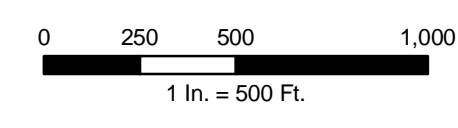
- Cheney Watershed Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sediment Ditch
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction

100-Yr Max Flow Depth (Ft)

- 0.004 - 0.083
- 0.084 - 0.500
- 0.501 - 1.000
- 1.001 - 2.000
- 2.001 - 9.438



**Foothill Improvement Area
Alternative: Foothill 1, 2 & 3**



PARADISE VALLEY WATERSHED STUDIES
CHENEY WATERSHED
PRELIMINARY ALTERNATIVES



Legend

Cheney Watershed Boundary

Identified Flooding Problem Areas
(Public Provided)

Maintenance Problem Areas
(Town Provided)

Improved Channels

Storm Mains

Storm Mains - Preliminary
(FCDMC)

Flow Direction

100-Yr Max Flow Depth (Ft)

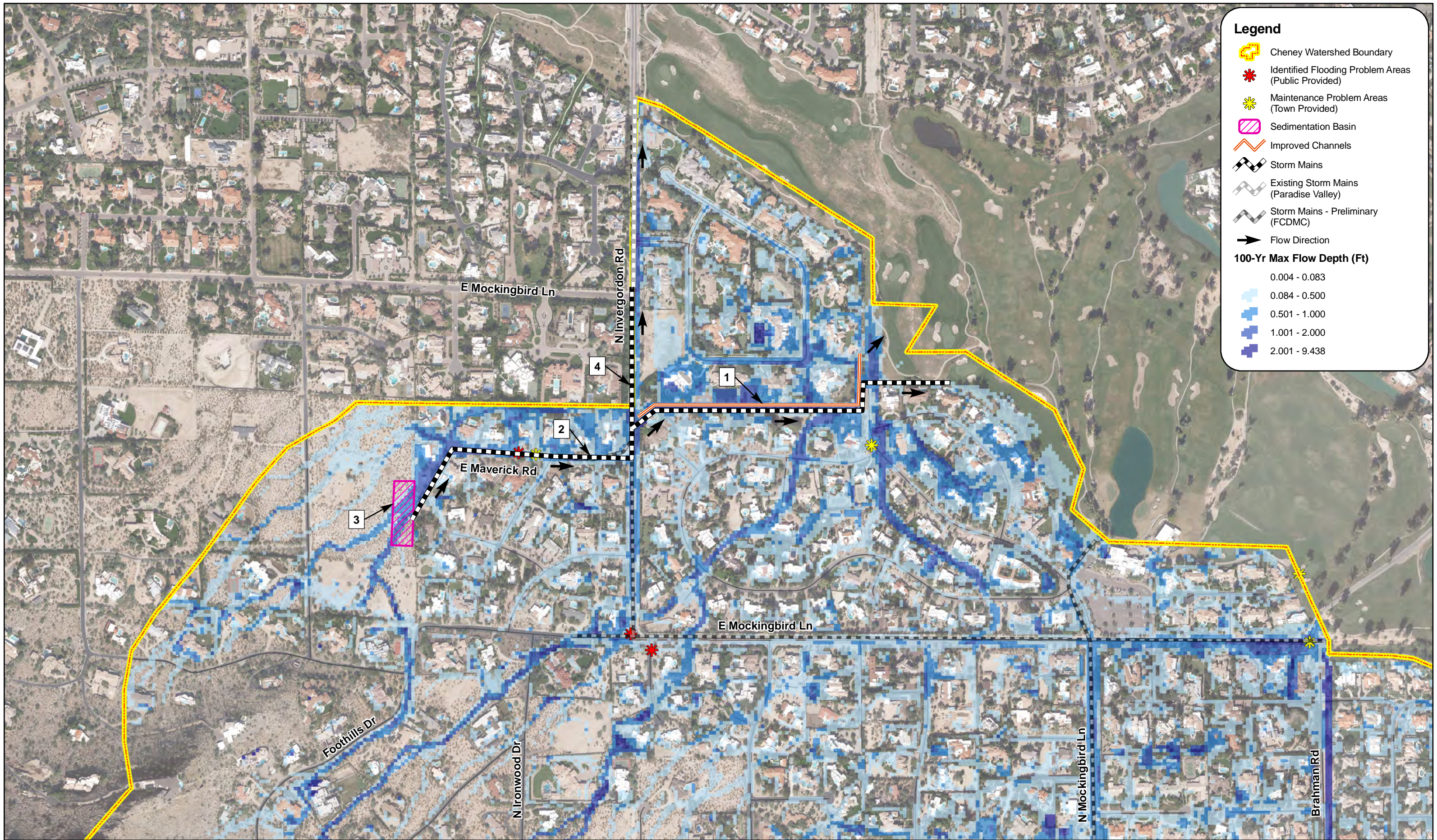
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0.084 - 0.500

0.501 - 1.000

1.001 - 2.000

2.001 - 9.438

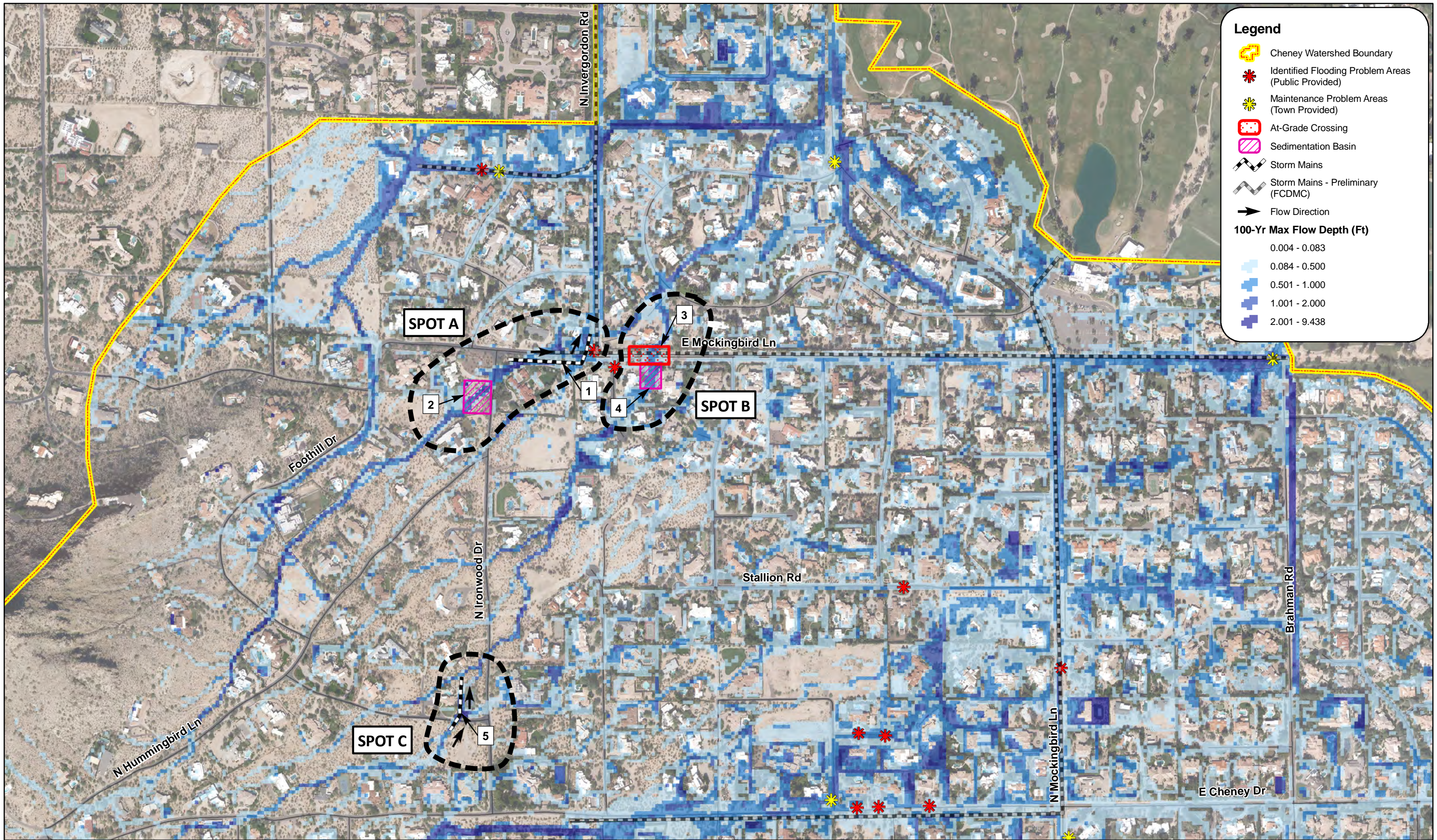


Legend

- Cheney Watershed Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sedimentation Basin
- Improved Channels
- Storm Mains
- Existing Storm Mains (Paradise Valley)
- Storm Mains - Preliminary (FCDMC)
- Flow Direction

100-Yr Max Flow Depth (Ft)

- 0.004 - 0.083
- 0.084 - 0.500
- 0.501 - 1.000
- 1.001 - 2.000
- 2.001 - 9.438



Legend

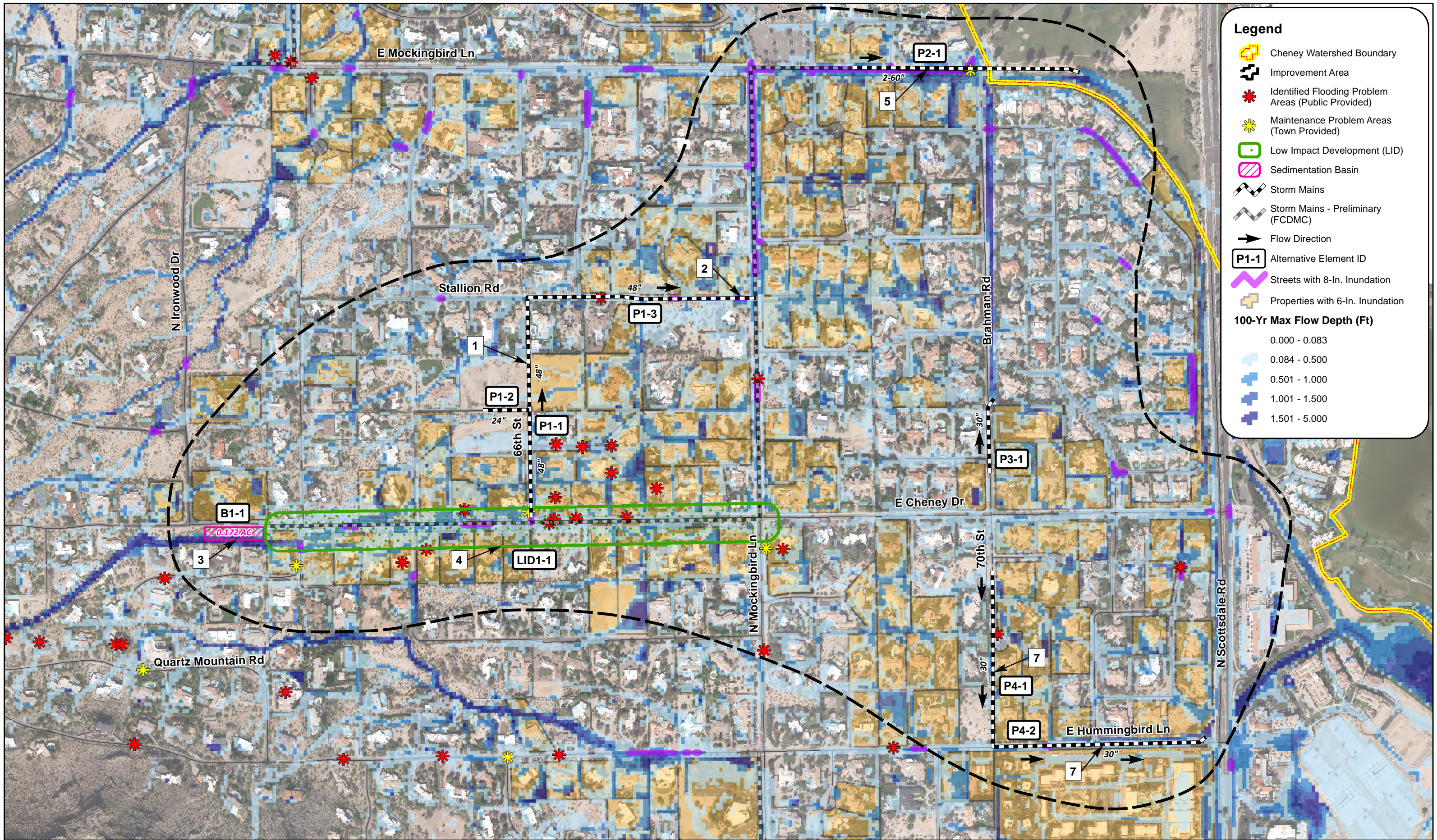
- Cheney Watershed Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- At-Grade Crossing
- Sedimentation Basin
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction

100-Yr Max Flow Depth (Ft)

- 0.004 - 0.083
- 0.084 - 0.500
- 0.501 - 1.000
- 1.001 - 2.000
- 2.001 - 9.438

Appendix C:

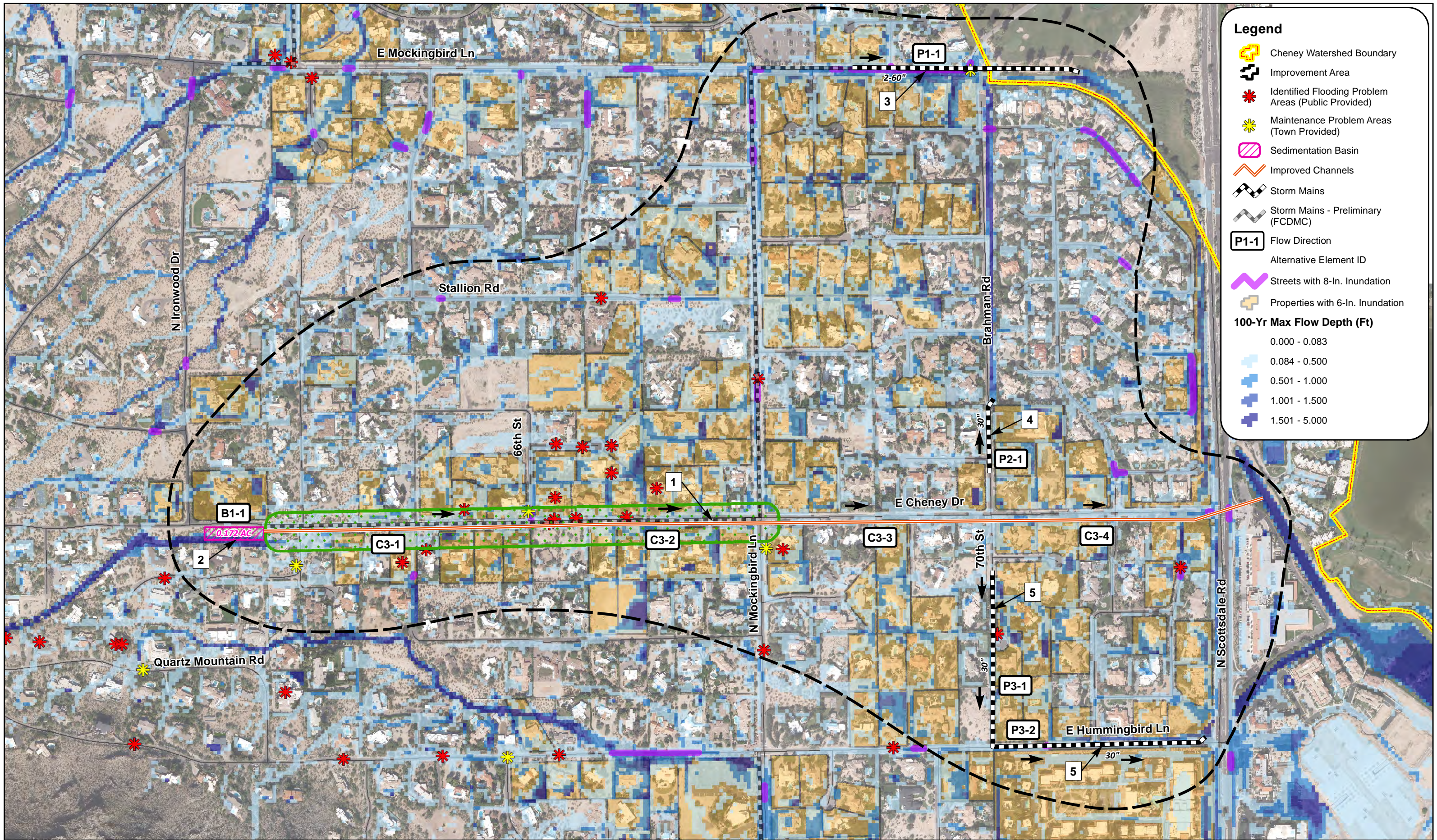
100-Year Modeled Alternatives Inundation Maps



Legend

- Cheney Watershed Boundary
 - Improvement Area
 - Identified Flooding Problem Areas (Public Provided)
 - Maintenance Problem Areas (Town Provided)
 - Low Impact Development (LID)
 - Sedimentation Basin
 - Storm Mains
 - Storm Mains - Preliminary (FCDMC)
 - Flow Direction
 - Alternative Element ID
 - Streets with 8-In. Inundation
 - Properties with 6-In. Inundation
- 100-Yr Max Flow Depth (Ft)**
- 0.000 - 0.083
 - 0.084 - 0.500
 - 0.501 - 1.000
 - 1.001 - 1.500
 - 1.501 - 5.000



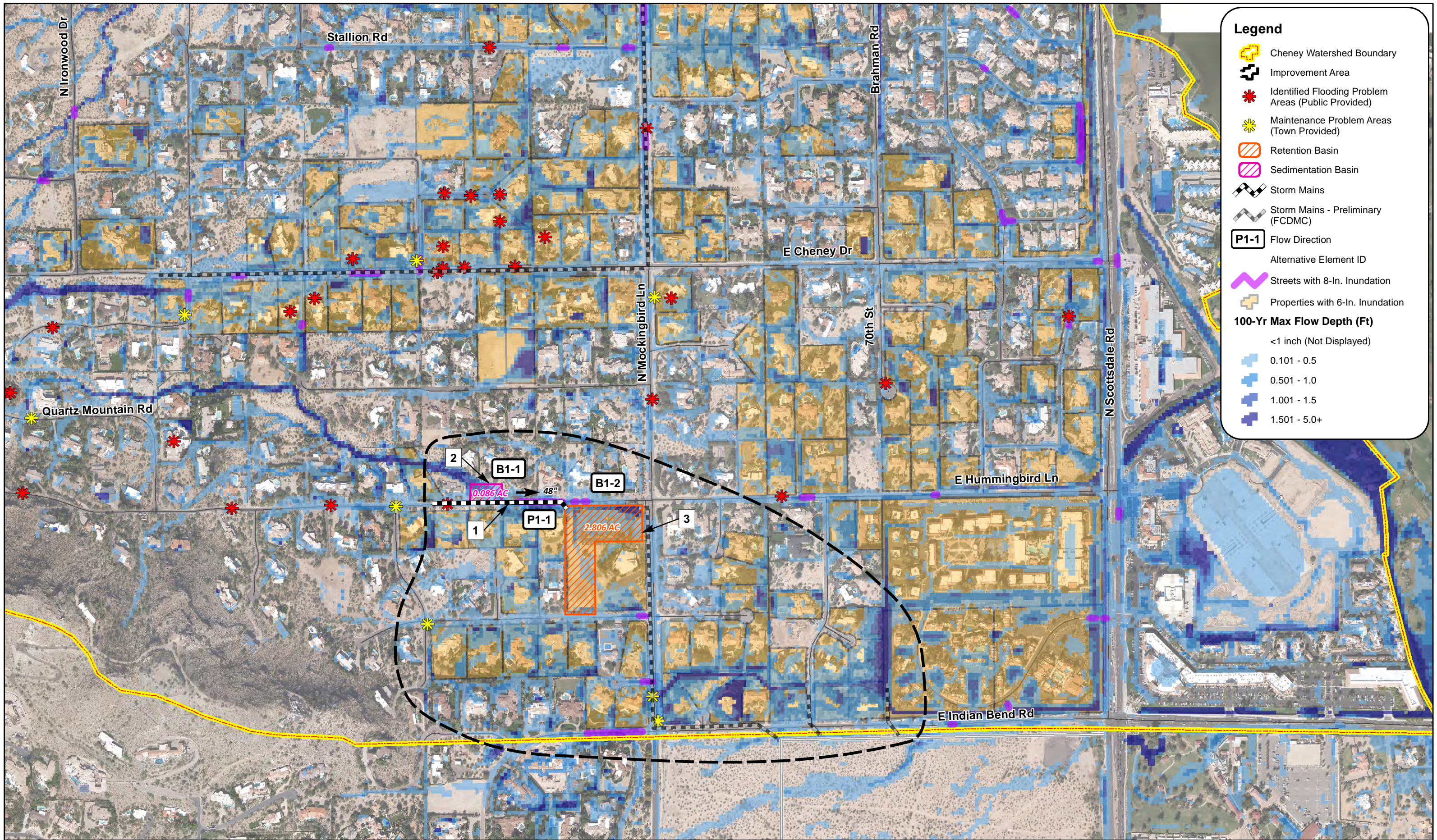


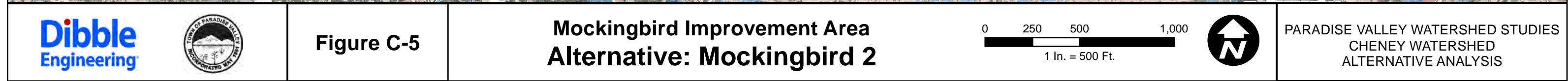
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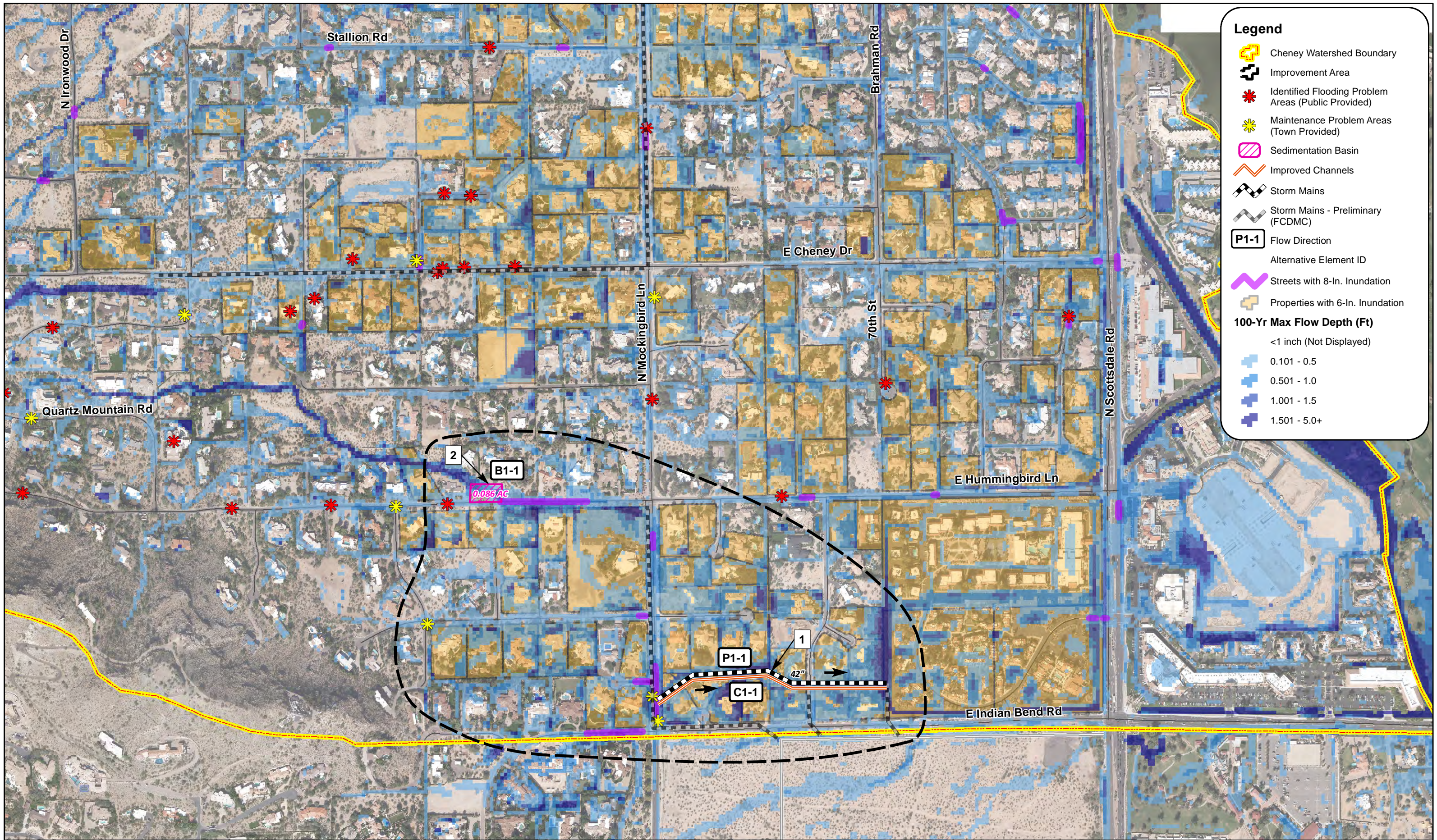
- Cheney Watershed Boundary
- Improvement Area
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sedimentation Basin
- Improved Channels
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
- Alternative Element ID
- Streets with 8-In. Inundation
- Properties with 6-In. Inundation

100-Yr Max Flow Depth (Ft)

- 0.000 - 0.083
- 0.084 - 0.500
- 0.501 - 1.000
- 1.001 - 1.500
- 1.501 - 5.000

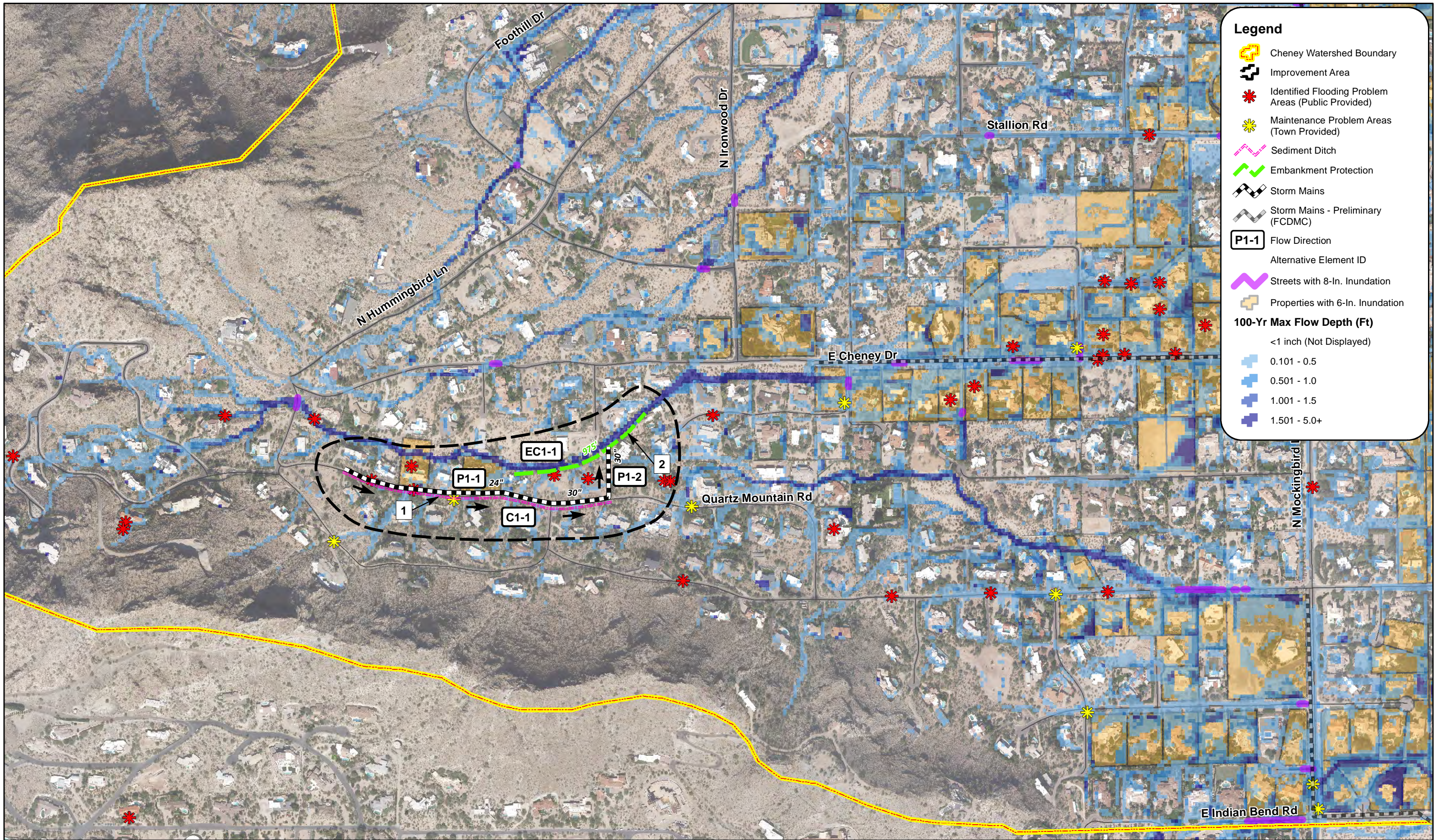


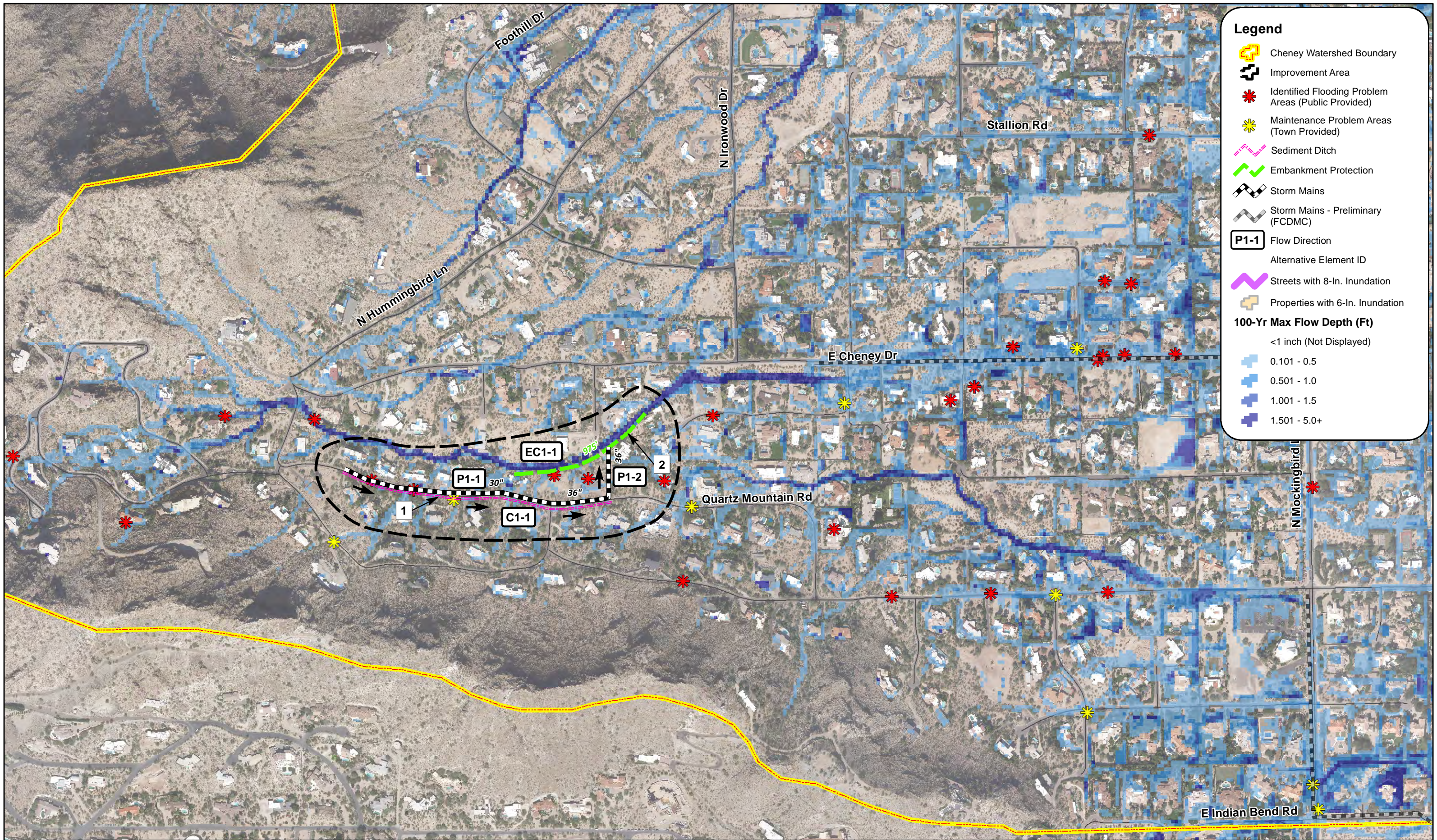




Legend

- Cheney Watershed Boundary
- Improvement Area
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sedimentation Basin
- Improved Channels
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- P1-1 Flow Direction
- Alternative Element ID
- Streets with 8-In. Inundation
- Properties with 6-In. Inundation
- 100-Yr Max Flow Depth (Ft)
 - <1 inch (Not Displayed)
 - 0.101 - 0.5
 - 0.501 - 1.0
 - 1.001 - 1.5
 - 1.501 - 5.0+





Legend

Cheney Watershed Boundary

Improvement Area

Identified Flooding Problem Areas (Public Provided)

Maintenance Problem Areas (Town Provided)

Sediment Ditch

Embankment Protection

Storm Mains

Storm Mains - Preliminary (FCDMC)

P1-1

Flow Direction

Alternative Element ID

Streets with 8-In. Inundation

Properties with 6-In. Inundation

100-Yr Max Flow Depth (Ft)

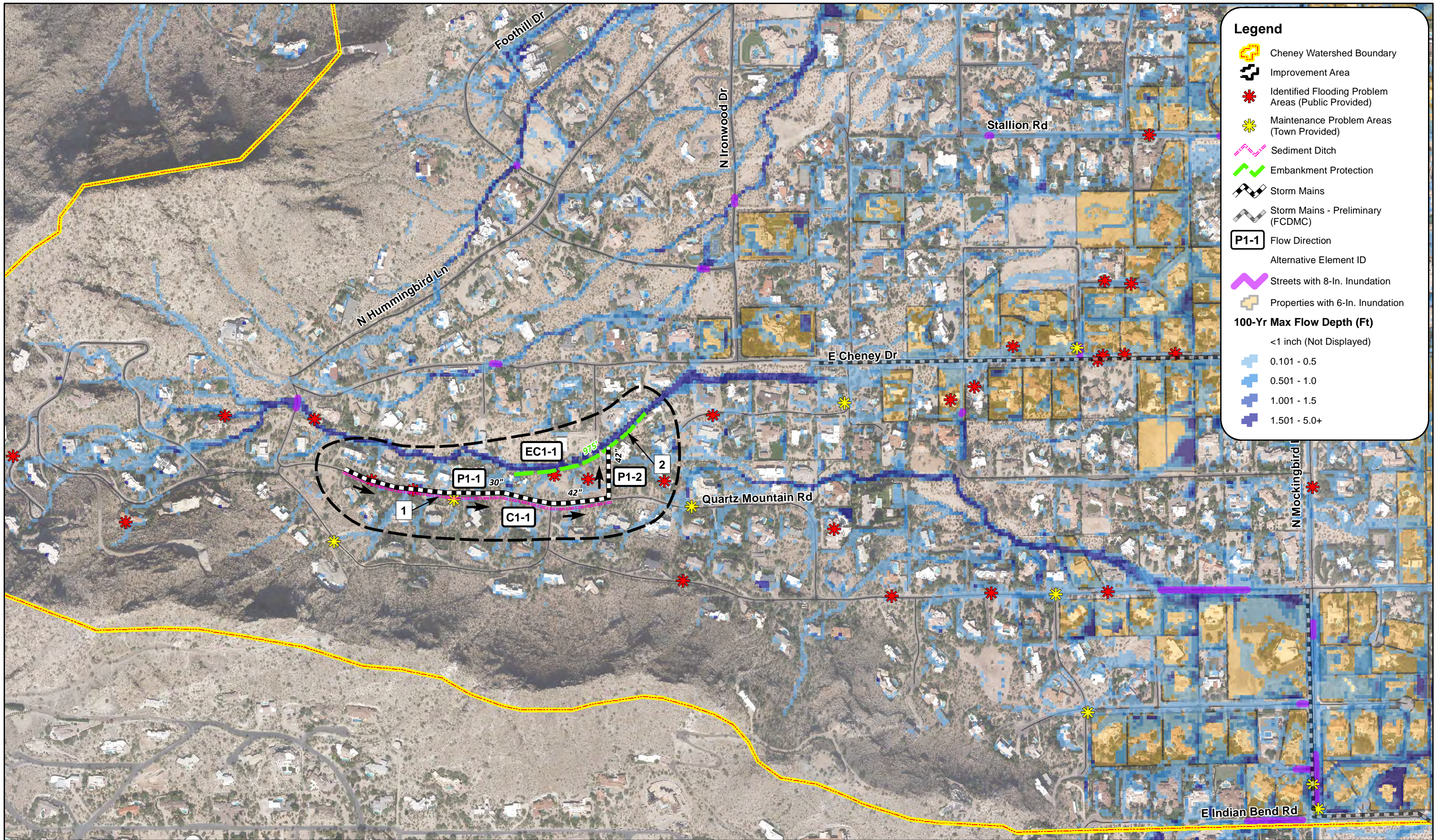
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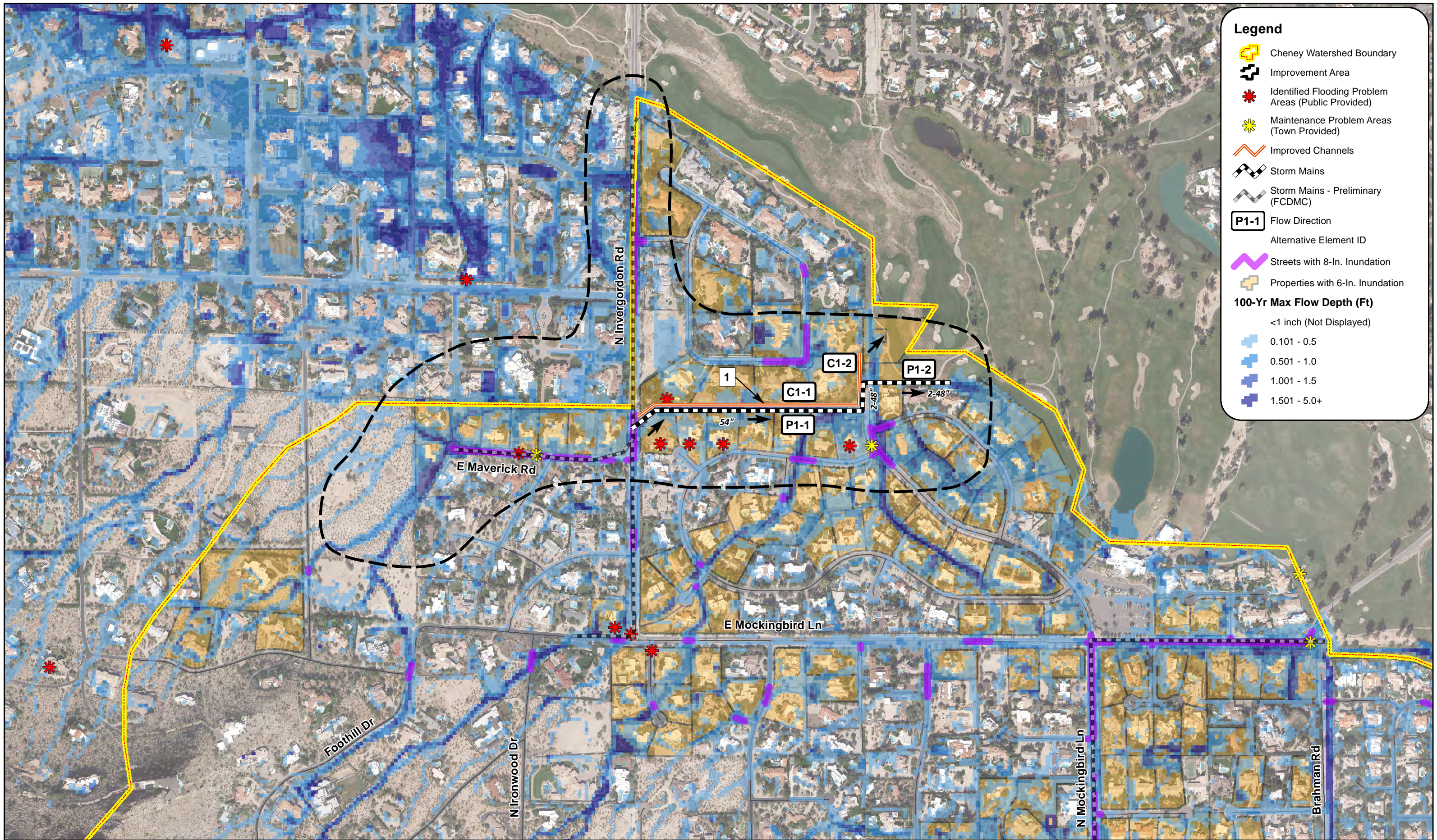
0.101 - 0.5

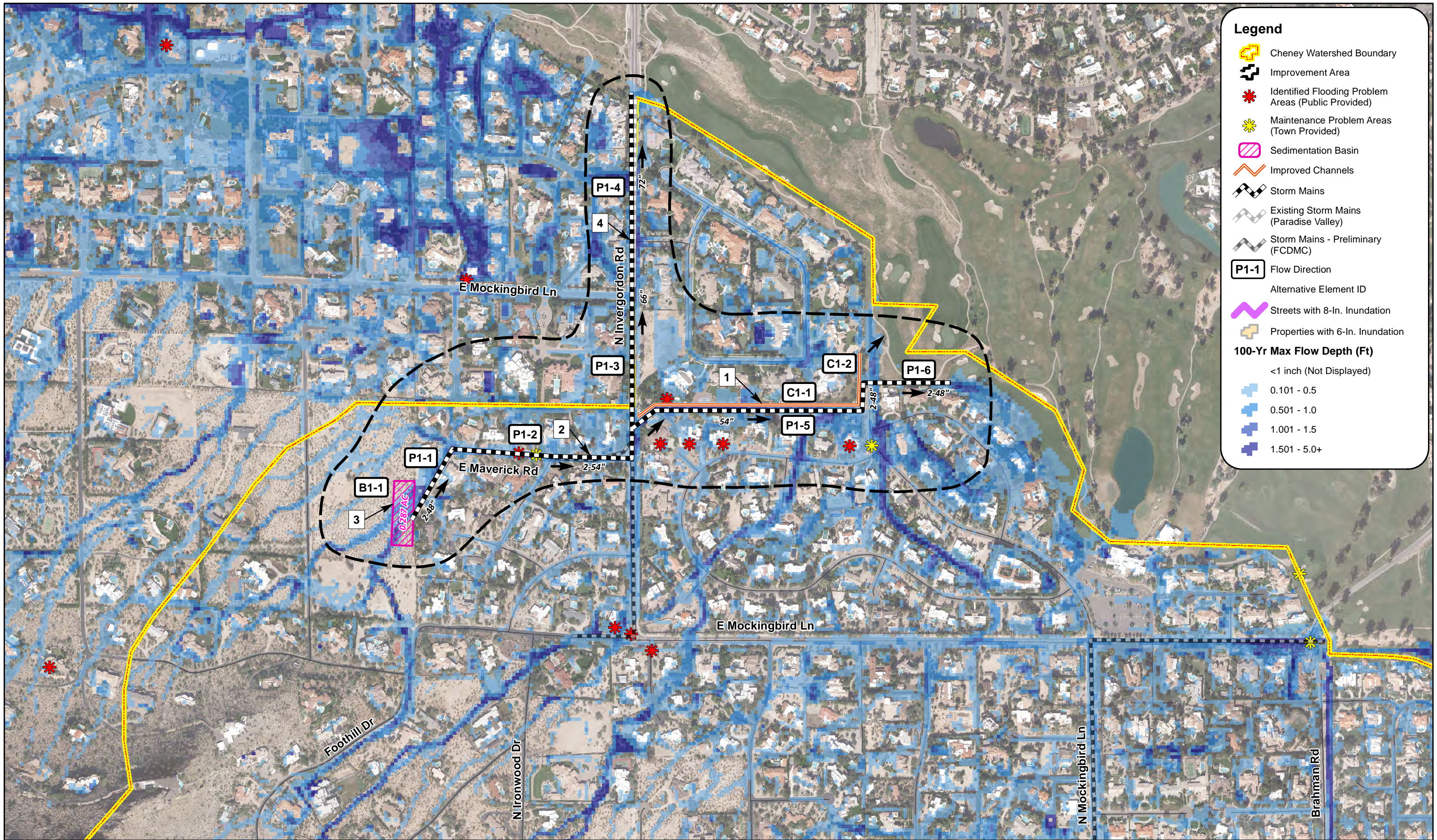
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1.001 - 1.5

1.501 - 5.0+



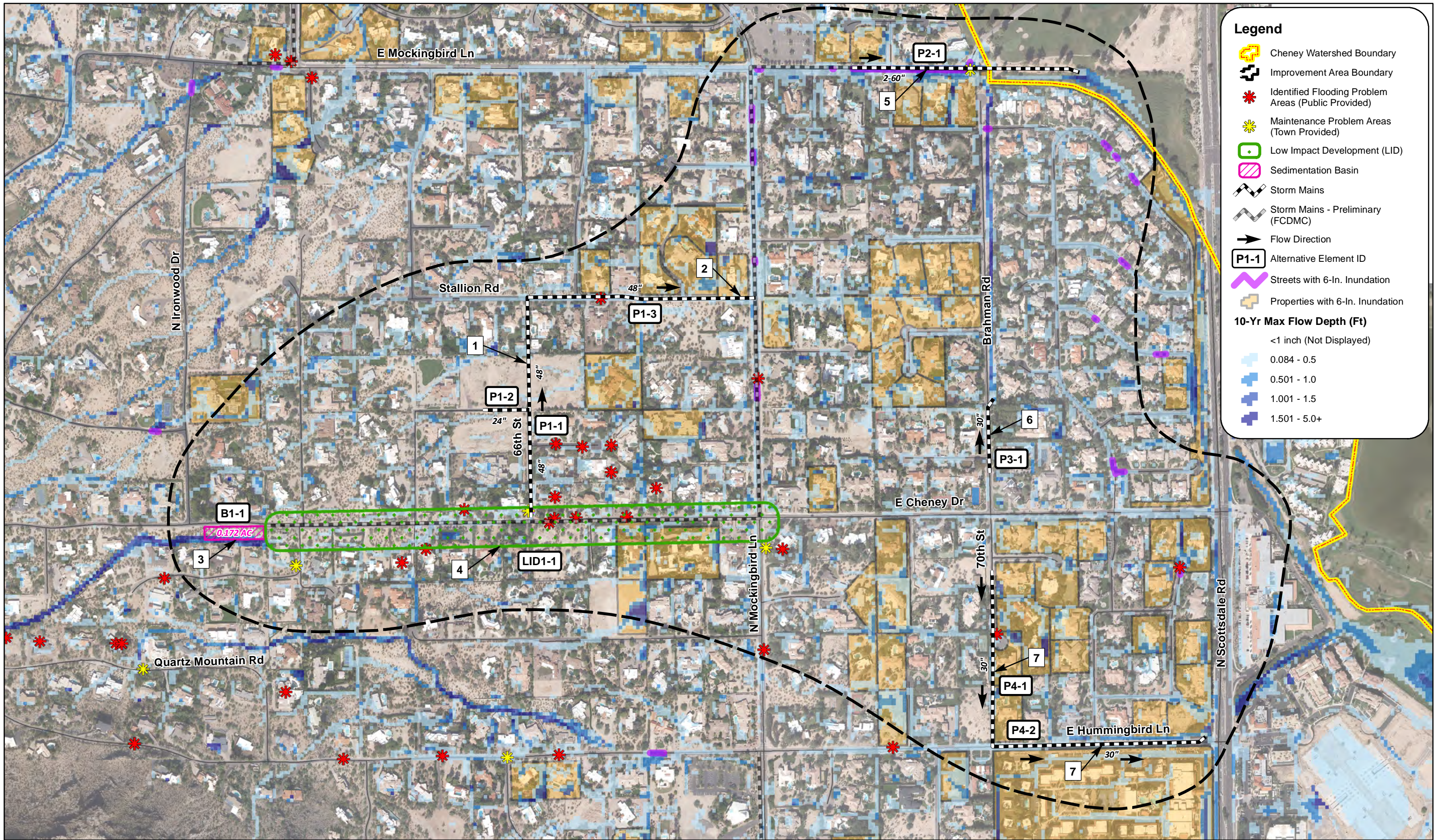


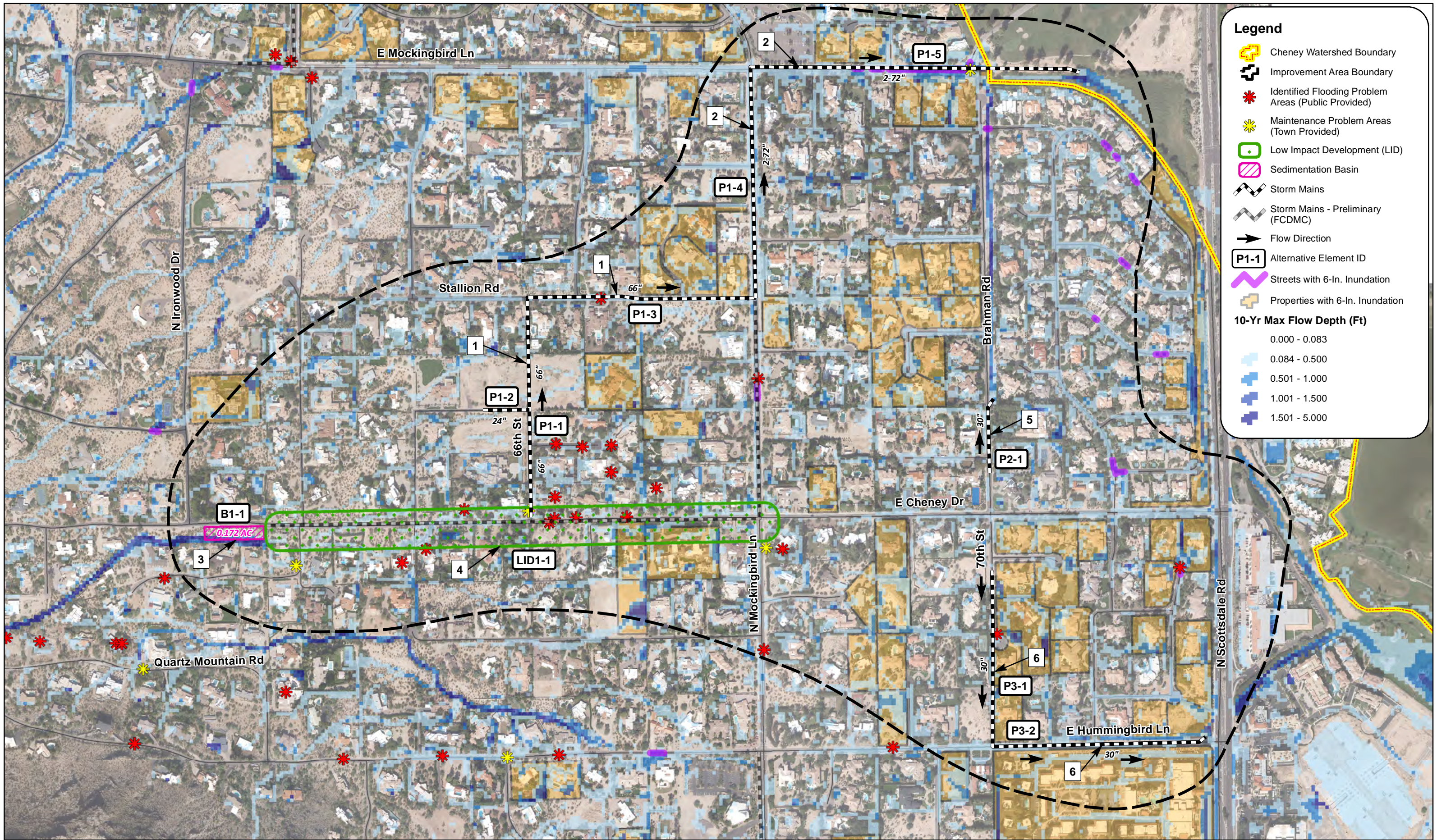


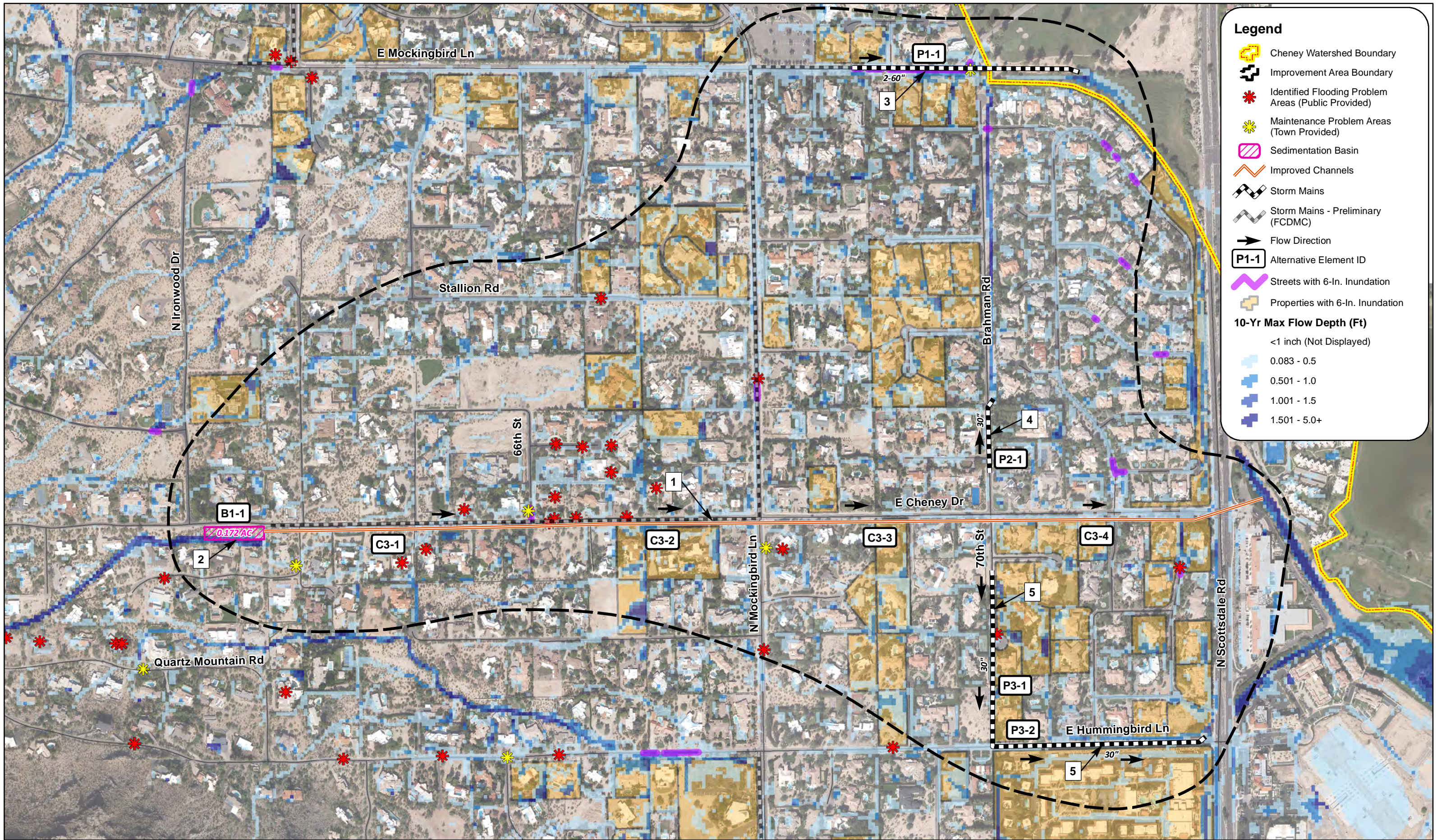
Legend

- Cheney Watershed Boundary
- Improvement Area
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sedimentation Basin
- Improved Channels
- Storm Mains
- Existing Storm Mains (Paradise Valley)
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
Alternative Element ID
- Streets with 8-In. Inundation
- Properties with 6-In. Inundation
- 100-Yr Max Flow Depth (Ft)**
- <1 inch (Not Displayed)
- 0.101 - 0.5
- 0.501 - 1.0
- 1.001 - 1.5
- 1.501 - 5.0+

Appendix D: 10-Year Modeled Alternatives Inundation Maps

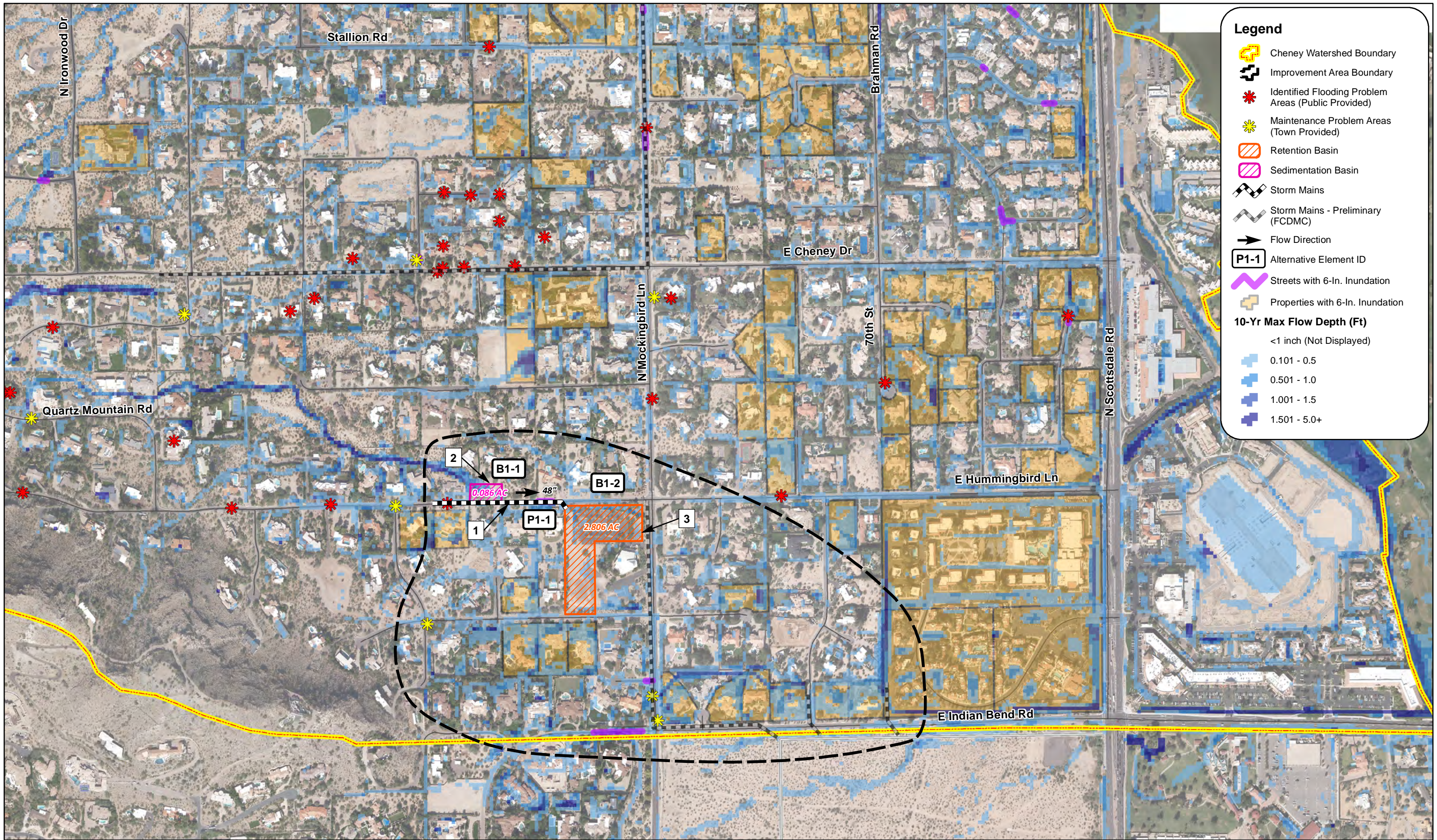


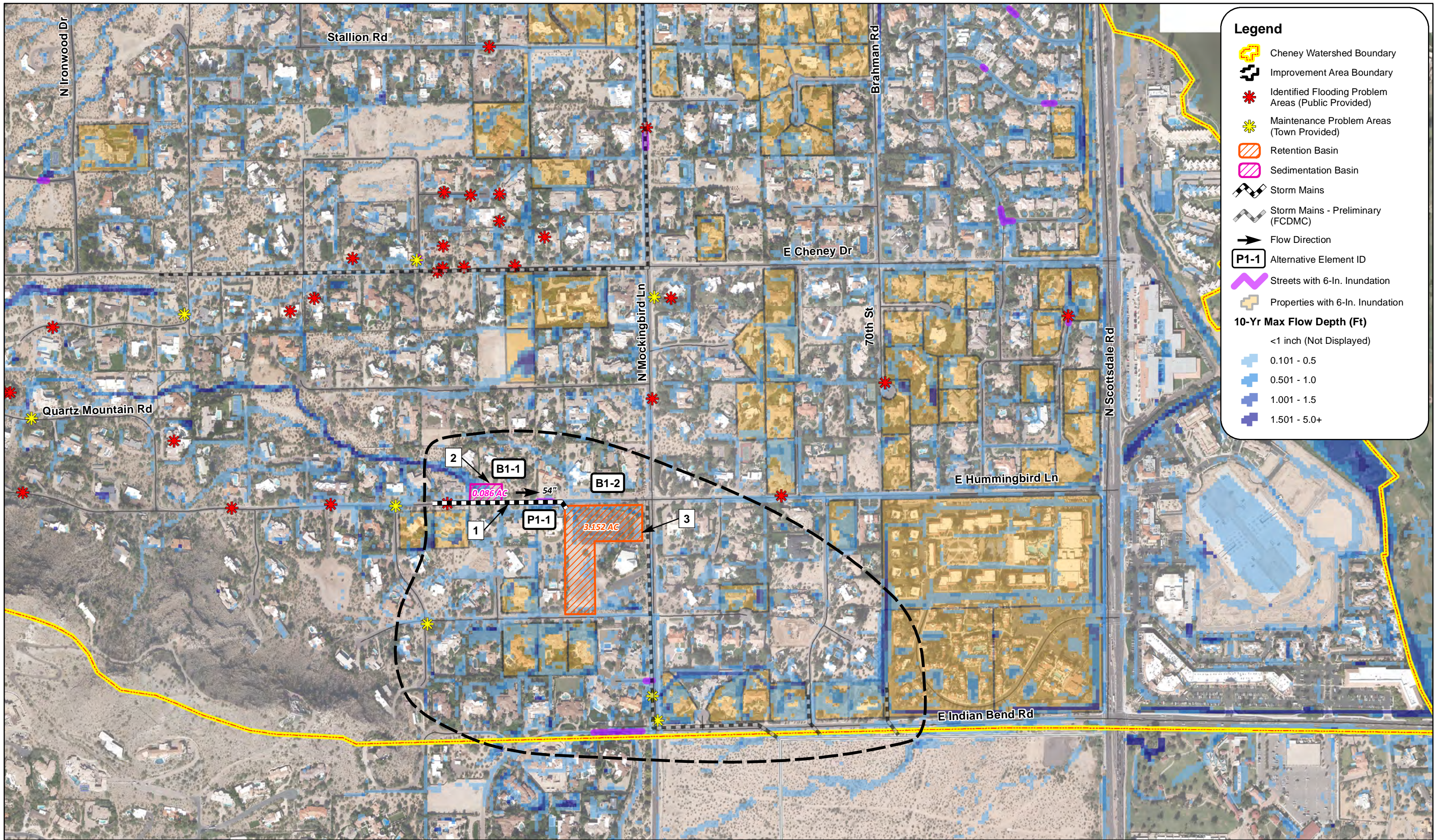


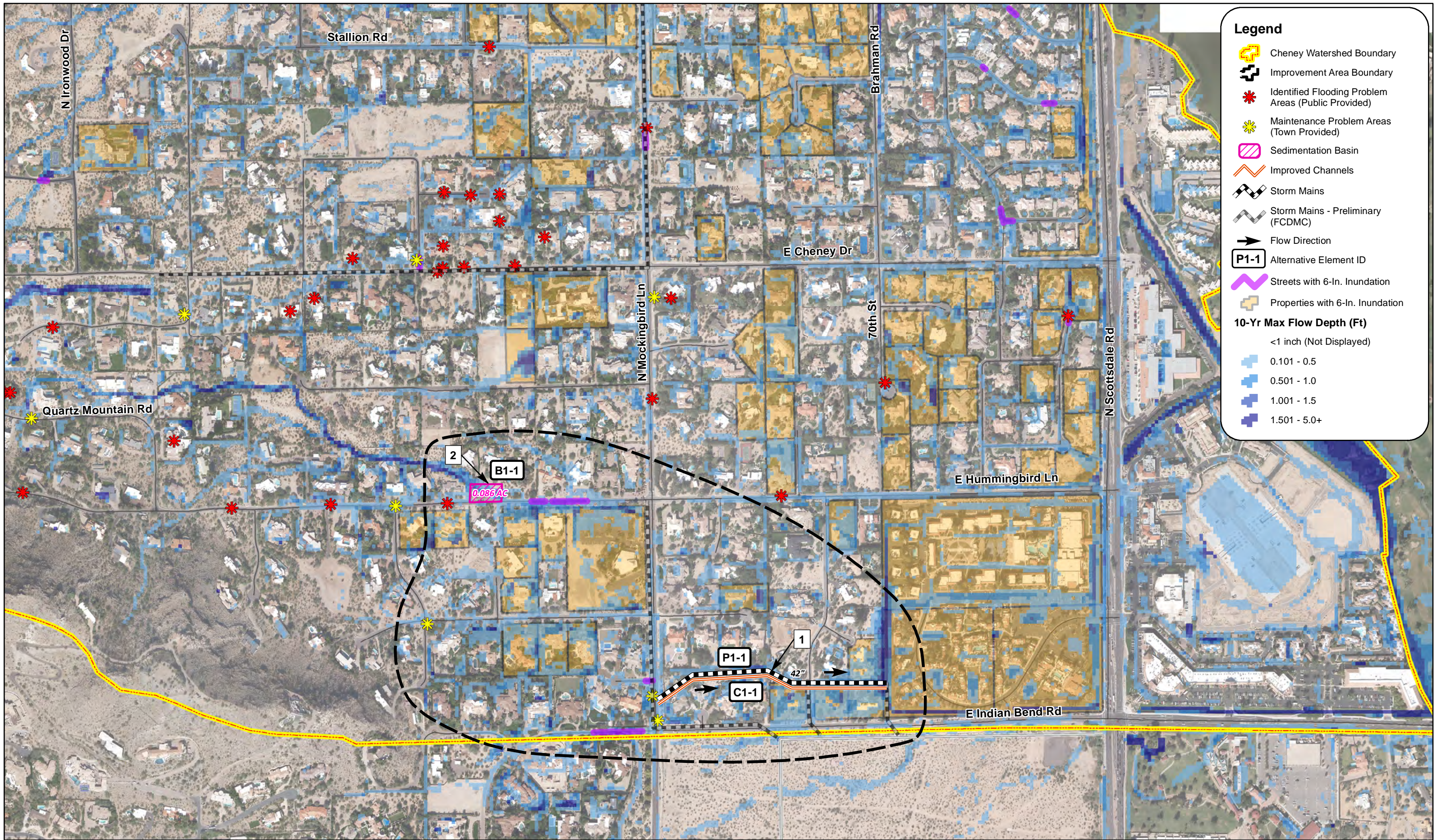


Legend

- Cheney Watershed Boundary
 - Improvement Area Boundary
 - Identified Flooding Problem Areas (Public Provided)
 - Maintenance Problem Areas (Town Provided)
 - Sedimentation Basin
 - Improved Channels
 - Storm Mains
 - Storm Mains - Preliminary (FCDMC)
 - Flow Direction
 - Alternative Element ID
 - Streets with 6-In. Inundation
 - Properties with 6-In. Inundation
- 10-Yr Max Flow Depth (Ft)**
- <1 inch (Not Displayed)
 - 0.083 - 0.5
 - 0.501 - 1.0
 - 1.001 - 1.5
 - 1.501 - 5.0+











Legend

- Cheney Watershed Boundary
- Improvement Area Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sediment Ditch
- Embankment Protection
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
- Alternative Element ID
- Streets with 6-In. Inundation
- Properties with 6-In. Inundation
- 10-Yr Max Flow Depth (Ft)**
 - <1 inch (Not Displayed)
 - 0.101 - 0.5
 - 0.501 - 1.0
 - 1.001 - 1.5
 - 1.501 - 5.0+



Legend

Cheney Watershed Boundary

Improvement Area Boundary

Identified Flooding Problem Areas (Public Provided)

Maintenance Problem Areas (Town Provided)

Sediment Ditch

Embankment Protection

Storm Mains

Storm Mains - Preliminary (FCDMC)

Flow Direction

Alternative Element ID

Streets with 6-In. Inundation

Properties with 6-In. Inundation

10-Yr Max Flow Depth (Ft)

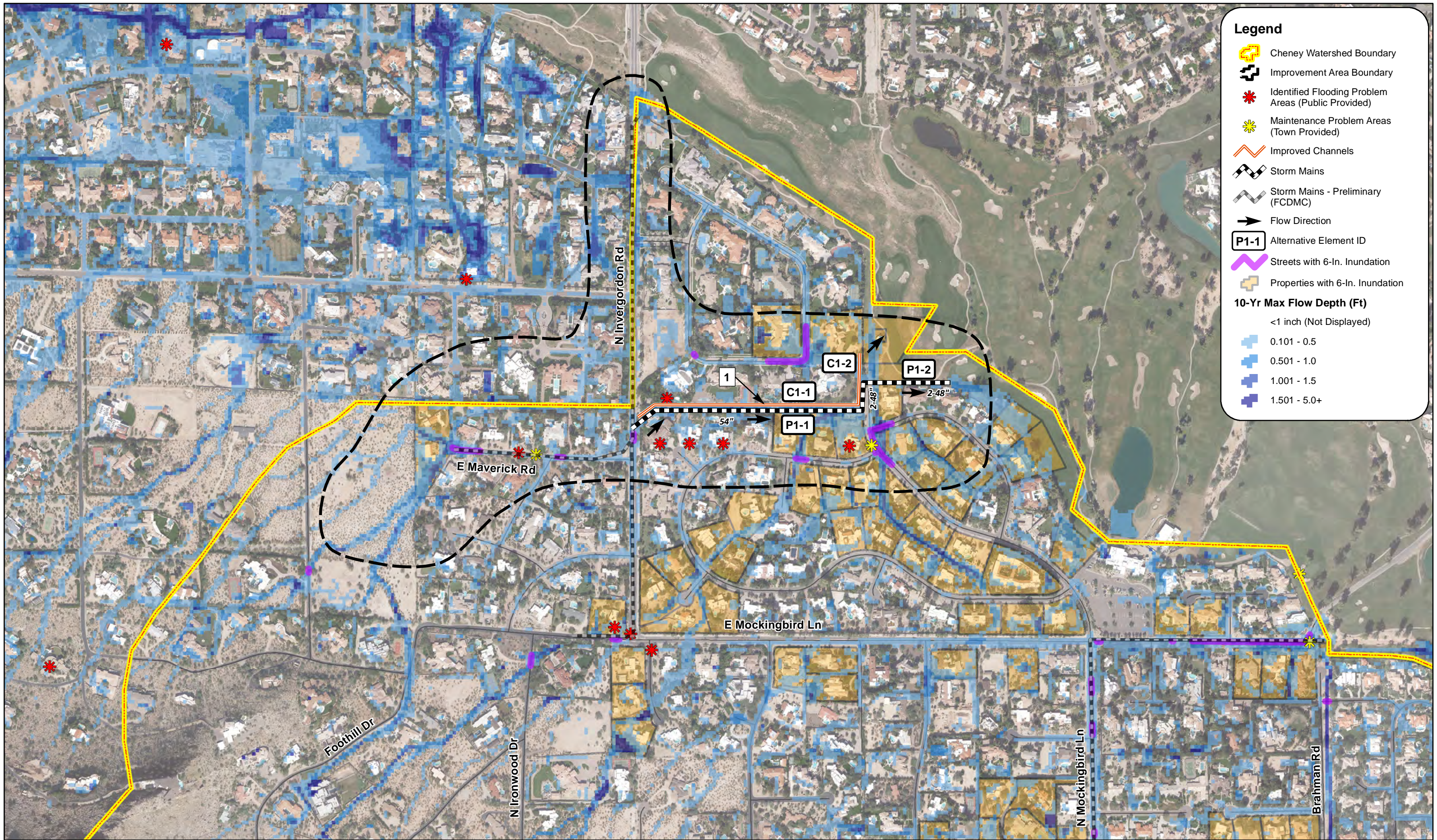
<1 inch (Not Displayed)

0.101 - 0.5

0.501 - 1.0

1.001 - 1.5

1.501 - 5.0+

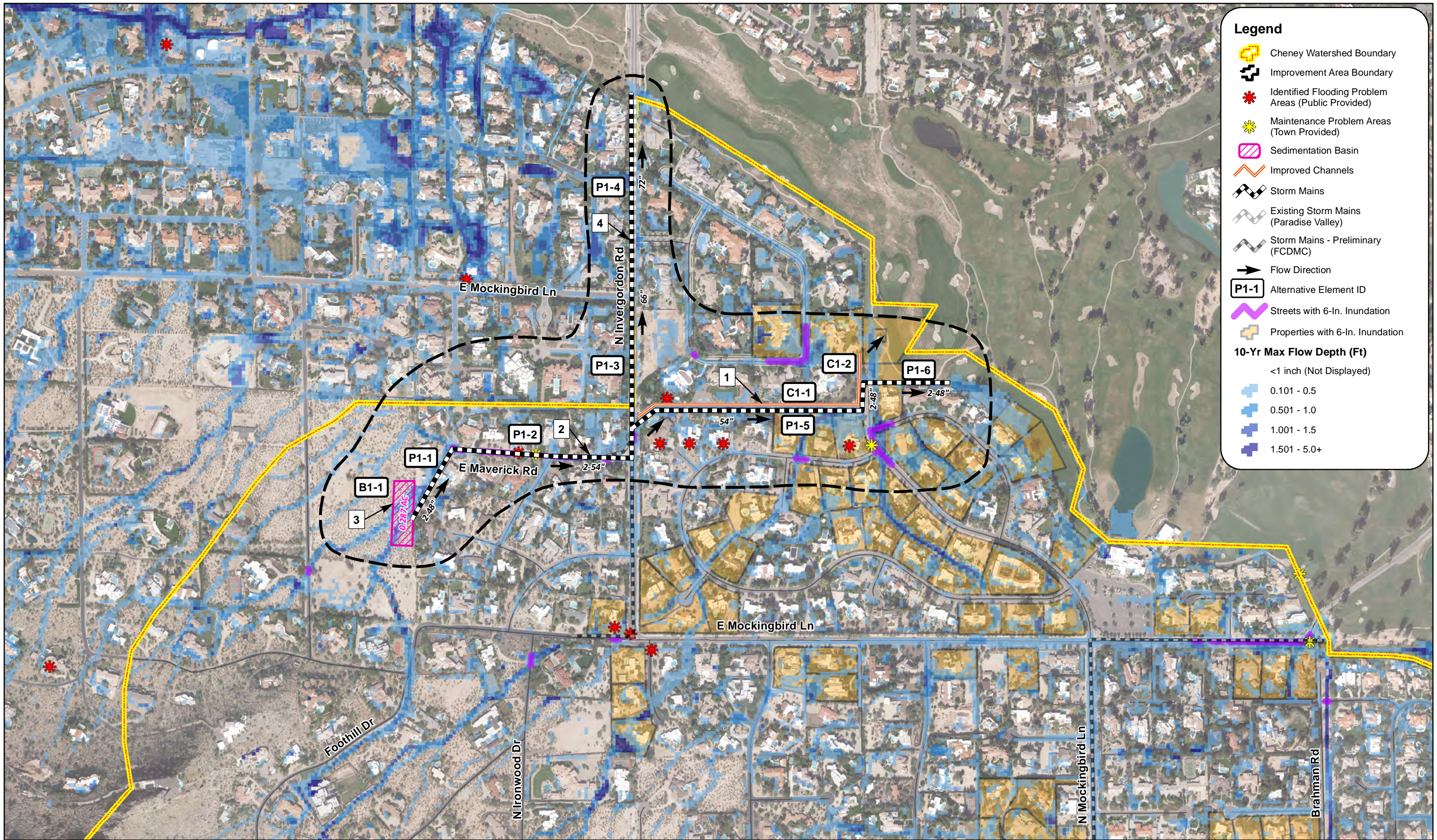


Legend

- Cheney Watershed Boundary
- Improvement Area Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Improved Channels
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
- Alternative Element ID
- Streets with 6-In. Inundation
- Properties with 6-In. Inundation

10-Yr Max Flow Depth (Ft)

- <1 inch (Not Displayed)
- 0.101 - 0.5
- 0.501 - 1.0
- 1.001 - 1.5
- 1.501 - 5.0+



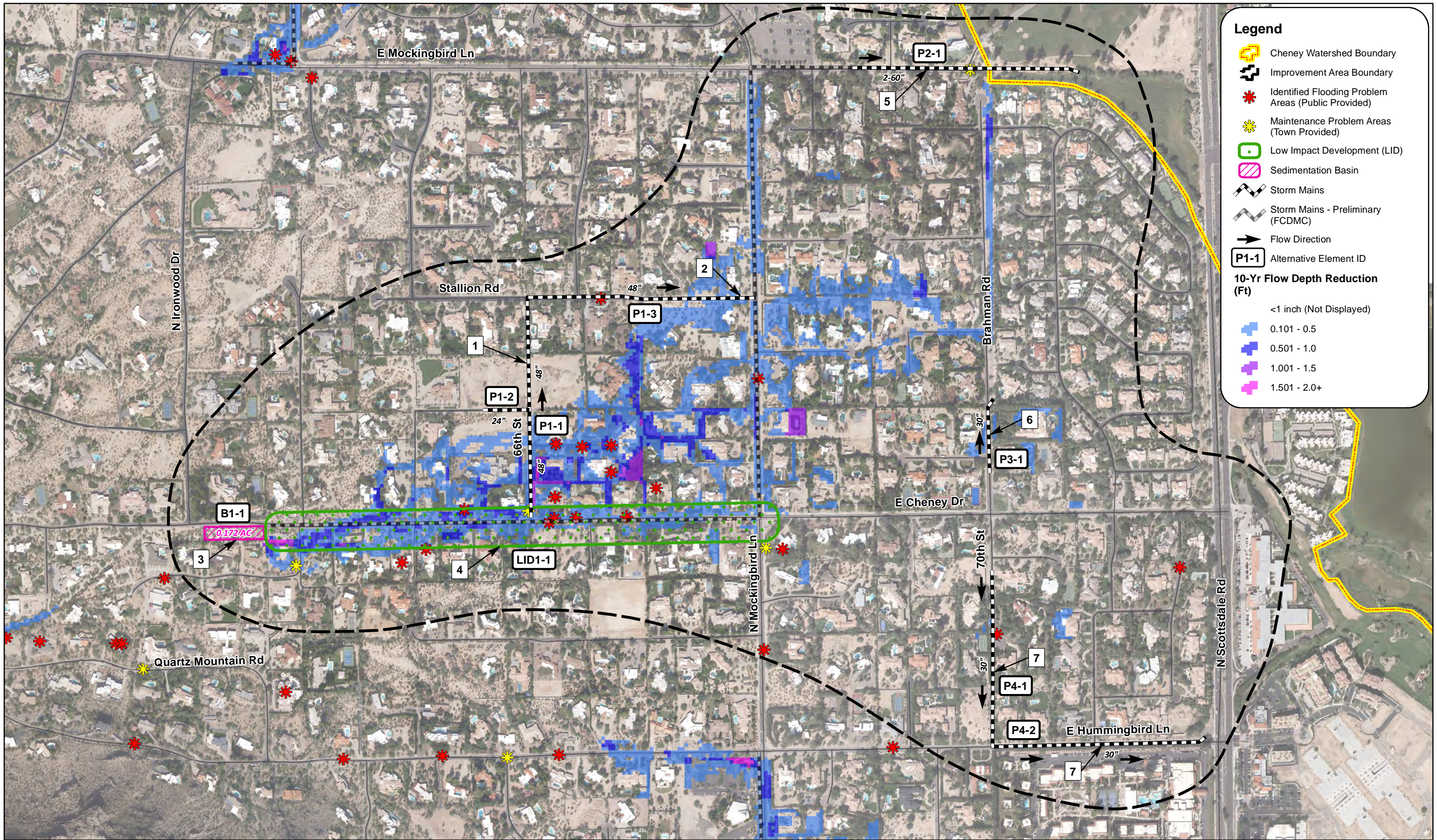
Legend

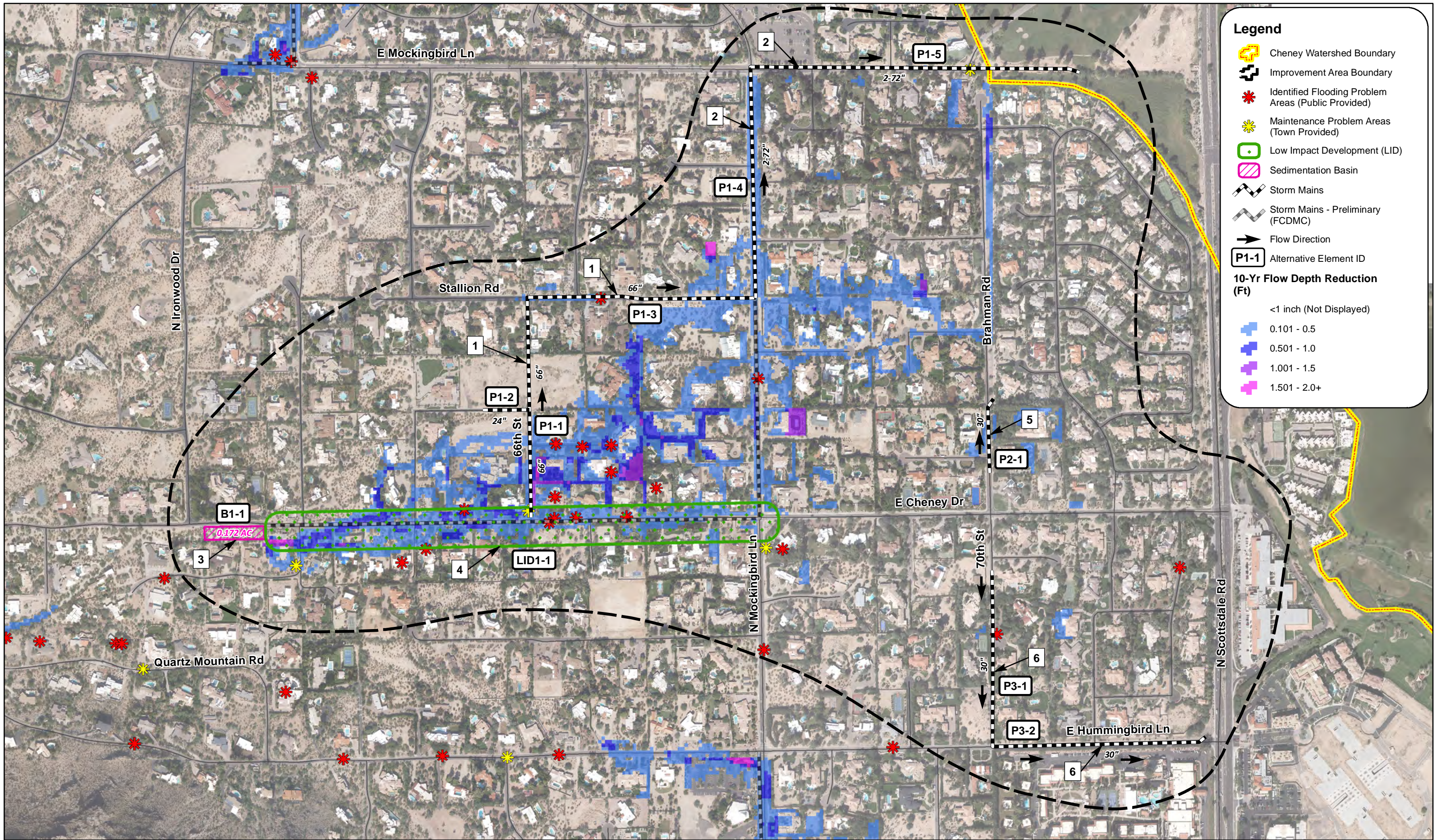
- Cheney Watershed Boundary
- Improvement Area Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sedimentation Basin
- Improved Channels
- Storm Mains
- Existing Storm Mains (Paradise Valley)
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
- Alternative Element ID
- Streets with 6-In. Inundation
- Properties with 6-In. Inundation

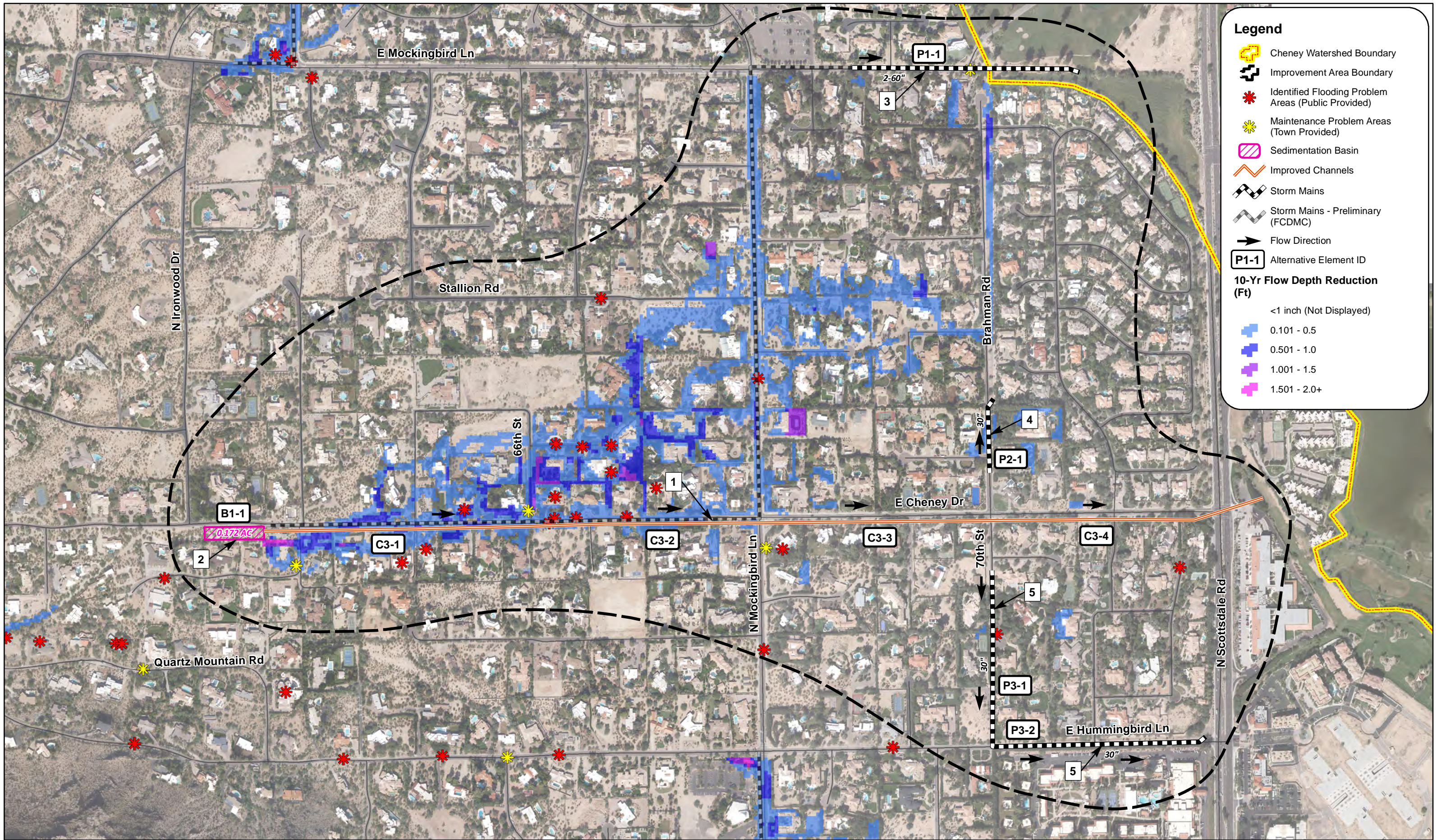
10-Yr Max Flow Depth (Ft)

- <1 inch (Not Displayed)
- 0.101 - 0.5
- 0.501 - 1.0
- 1.001 - 1.5
- 1.501 - 5.0+

Appendix E: 10-Year Storm Depth Reduction Maps







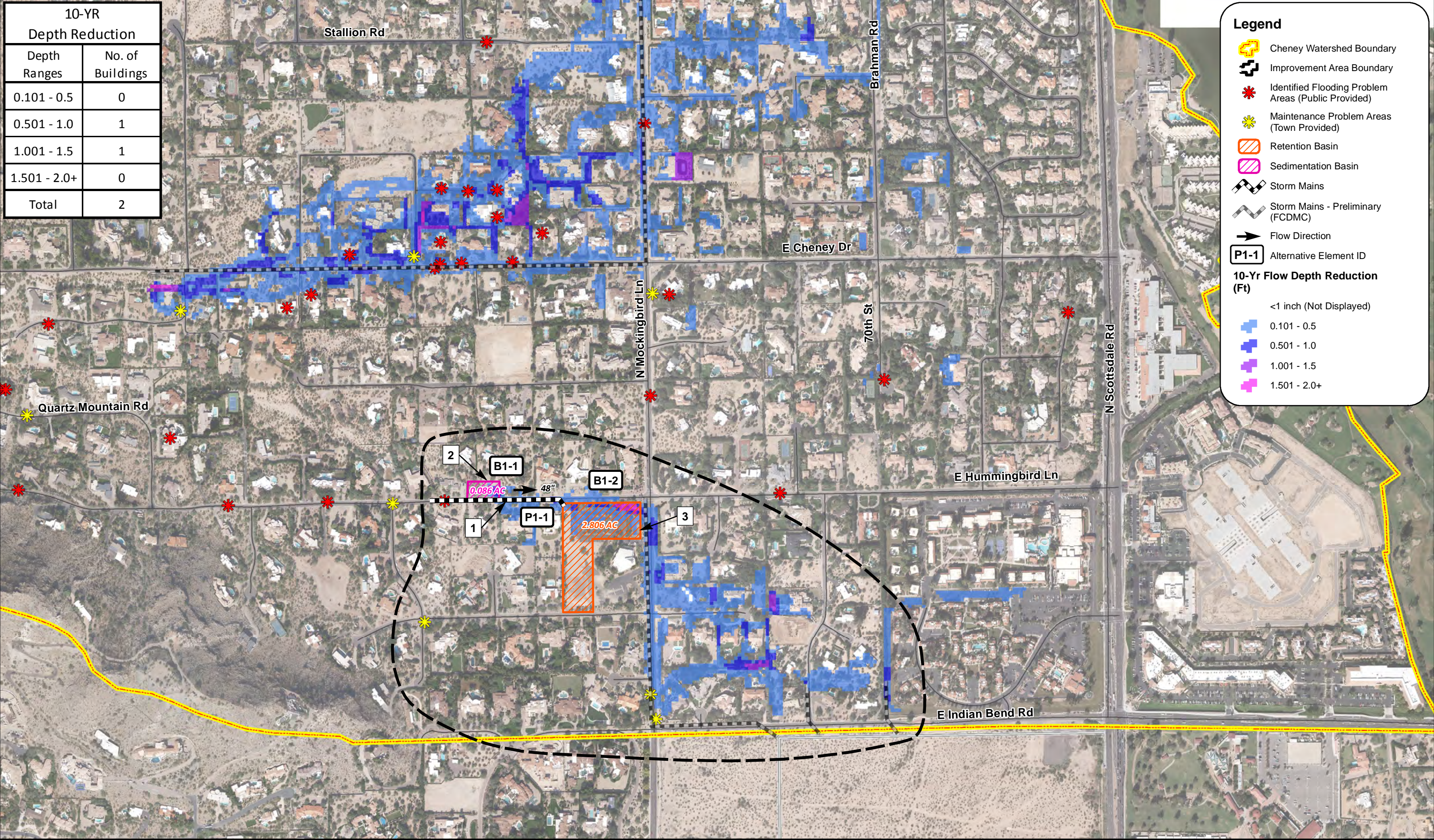
Legend

- Cheney Watershed Boundary
- Improvement Area Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sedimentation Basin
- Improved Channels
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
- Alternative Element ID

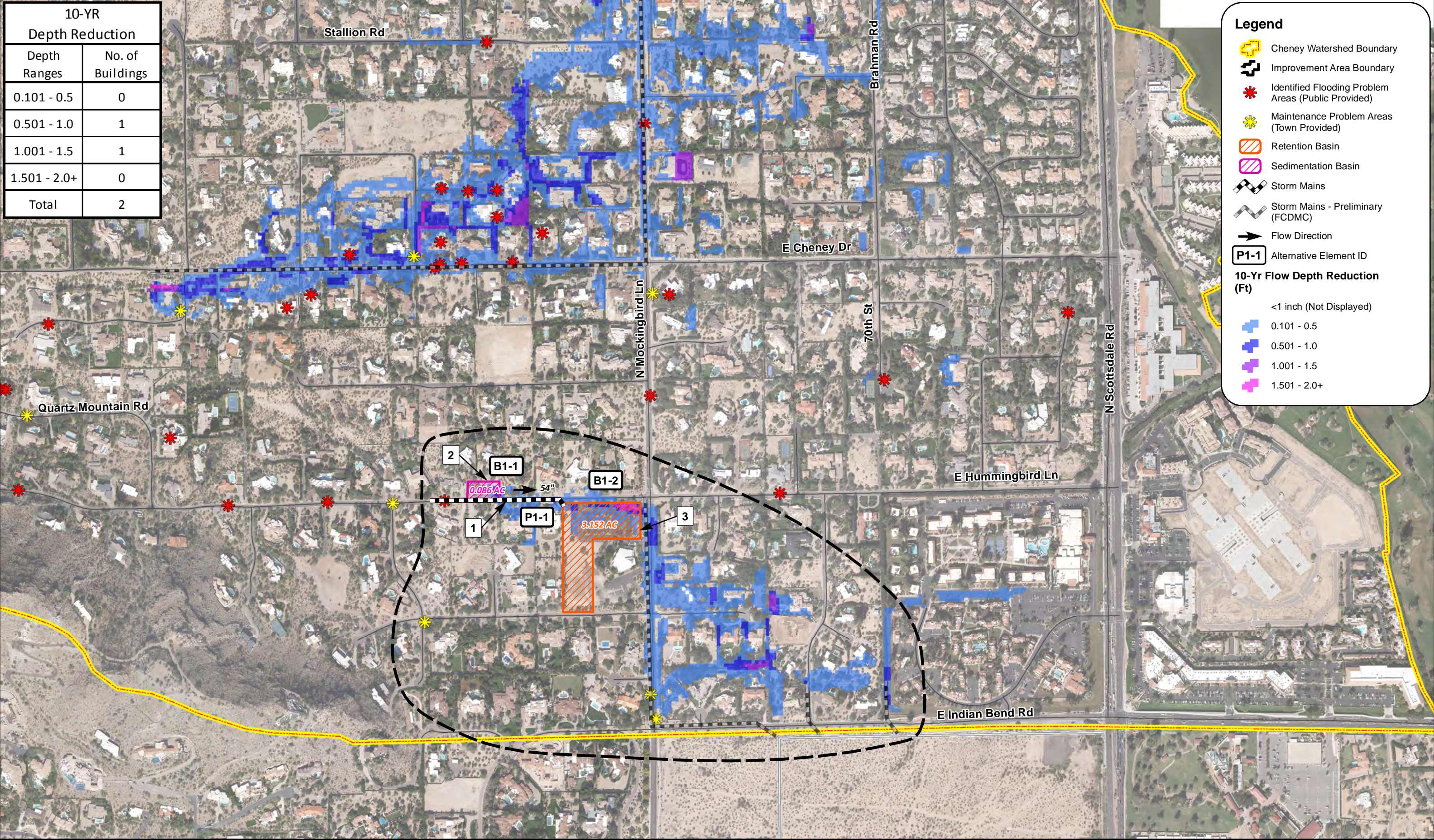
10-Yr Flow Depth Reduction (Ft)

- <1 inch (Not Displayed)
- 0.101 - 0.5
- 0.501 - 1.0
- 1.001 - 1.5
- 1.501 - 2.0+

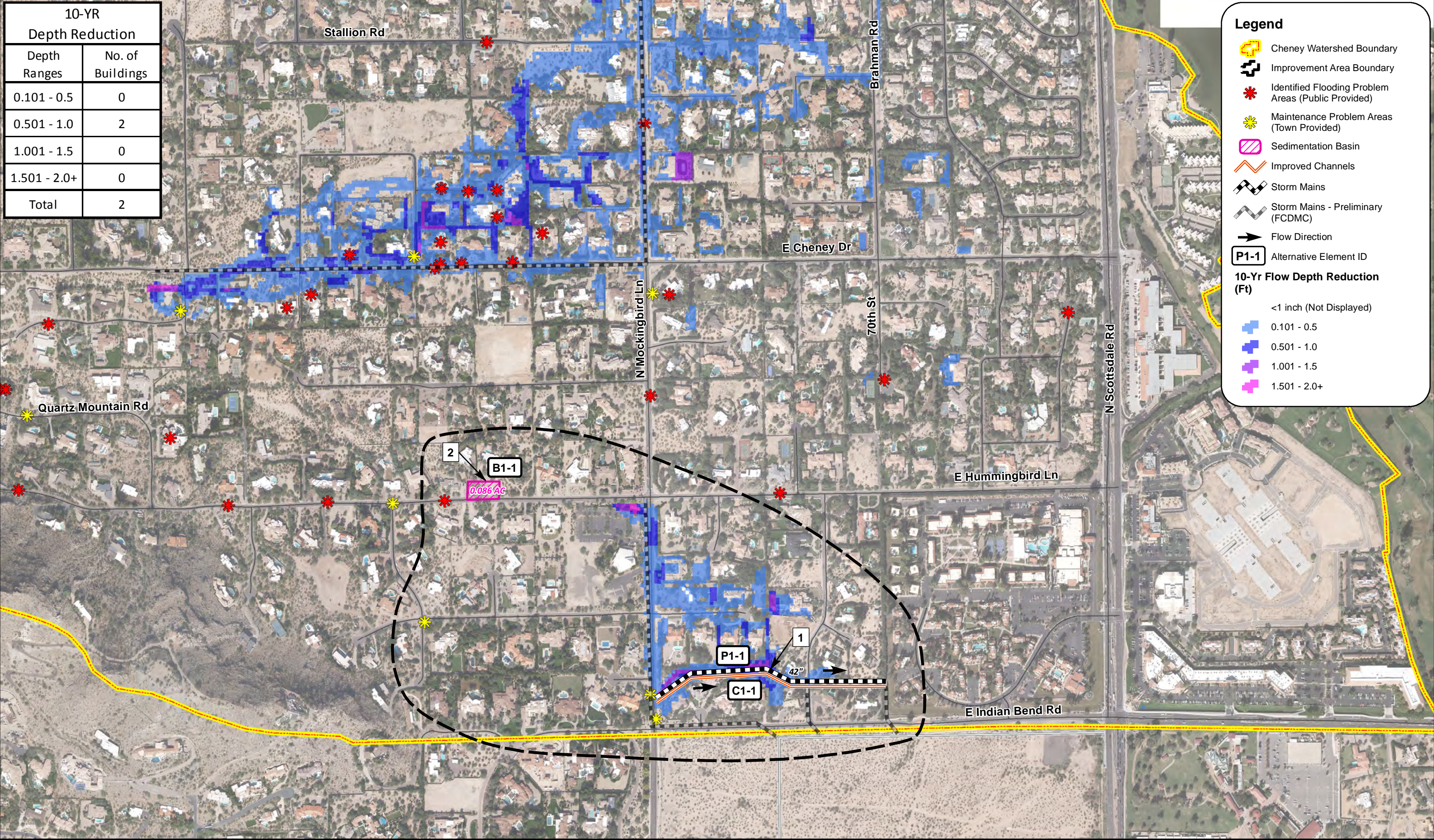
10-YR Depth Reduction	
Depth Ranges	No. of Buildings
0.101 - 0.5	0
0.501 - 1.0	1
1.001 - 1.5	1
1.501 - 2.0+	0
Total	2



10-YR Depth Reduction	
Depth Ranges	No. of Buildings
0.101 - 0.5	0
0.501 - 1.0	1
1.001 - 1.5	1
1.501 - 2.0+	0
Total	2



10-YR Depth Reduction	
Depth Ranges	No. of Buildings
0.101 - 0.5	0
0.501 - 1.0	2
1.001 - 1.5	0
1.501 - 2.0+	0
Total	2

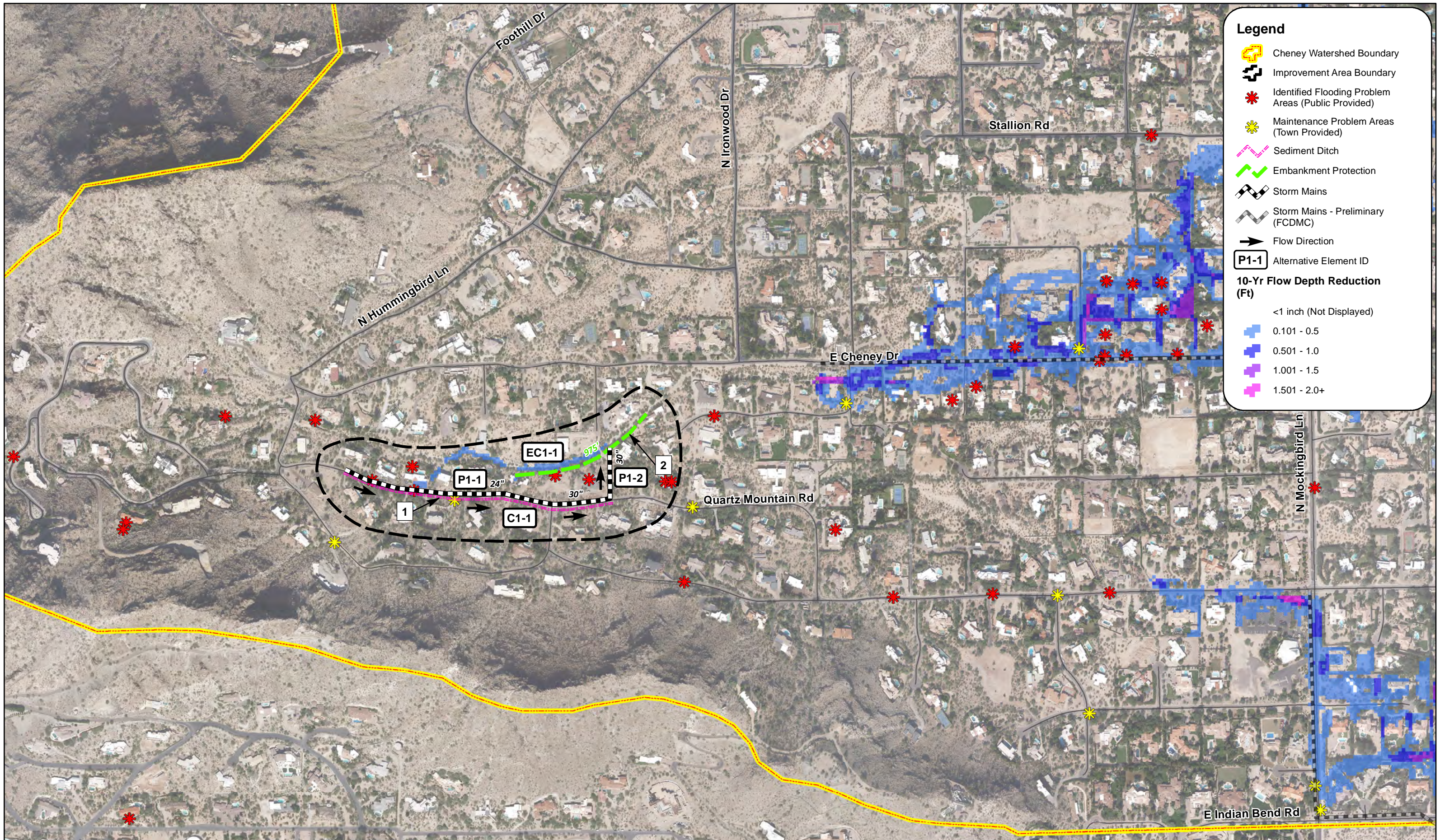


Legend

- Cheney Watershed Boundary
- Improvement Area Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sedimentation Basin
- Improved Channels
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
- Alternative Element ID

10-Yr Flow Depth Reduction (Ft)

- <1 inch (Not Displayed)
- 0.101 - 0.5
- 0.501 - 1.0
- 1.001 - 1.5
- 1.501 - 2.0+

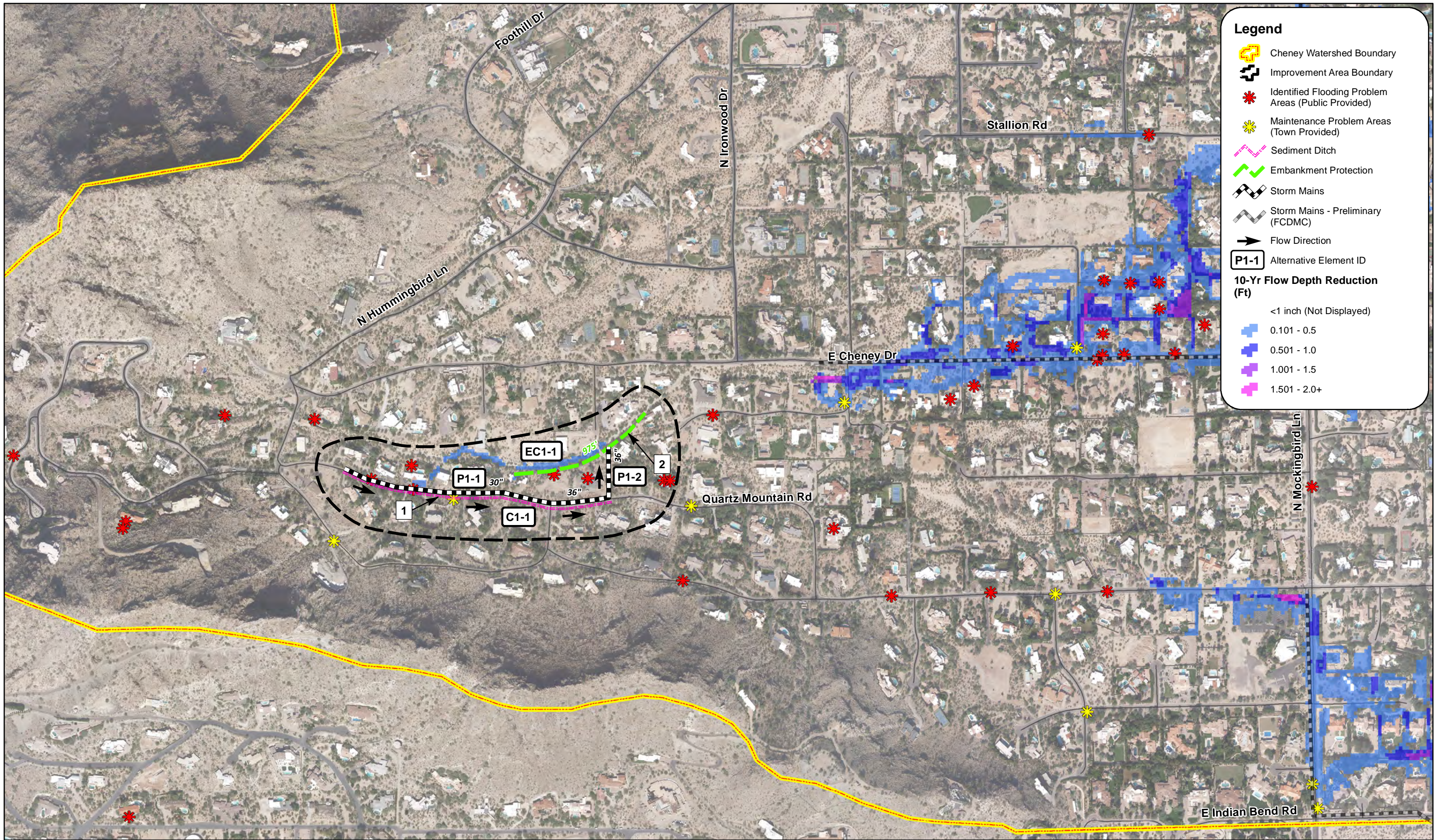


Legend

- Cheney Watershed Boundary
- Improvement Area Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sediment Ditch
- Embankment Protection
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
- Alternative Element ID

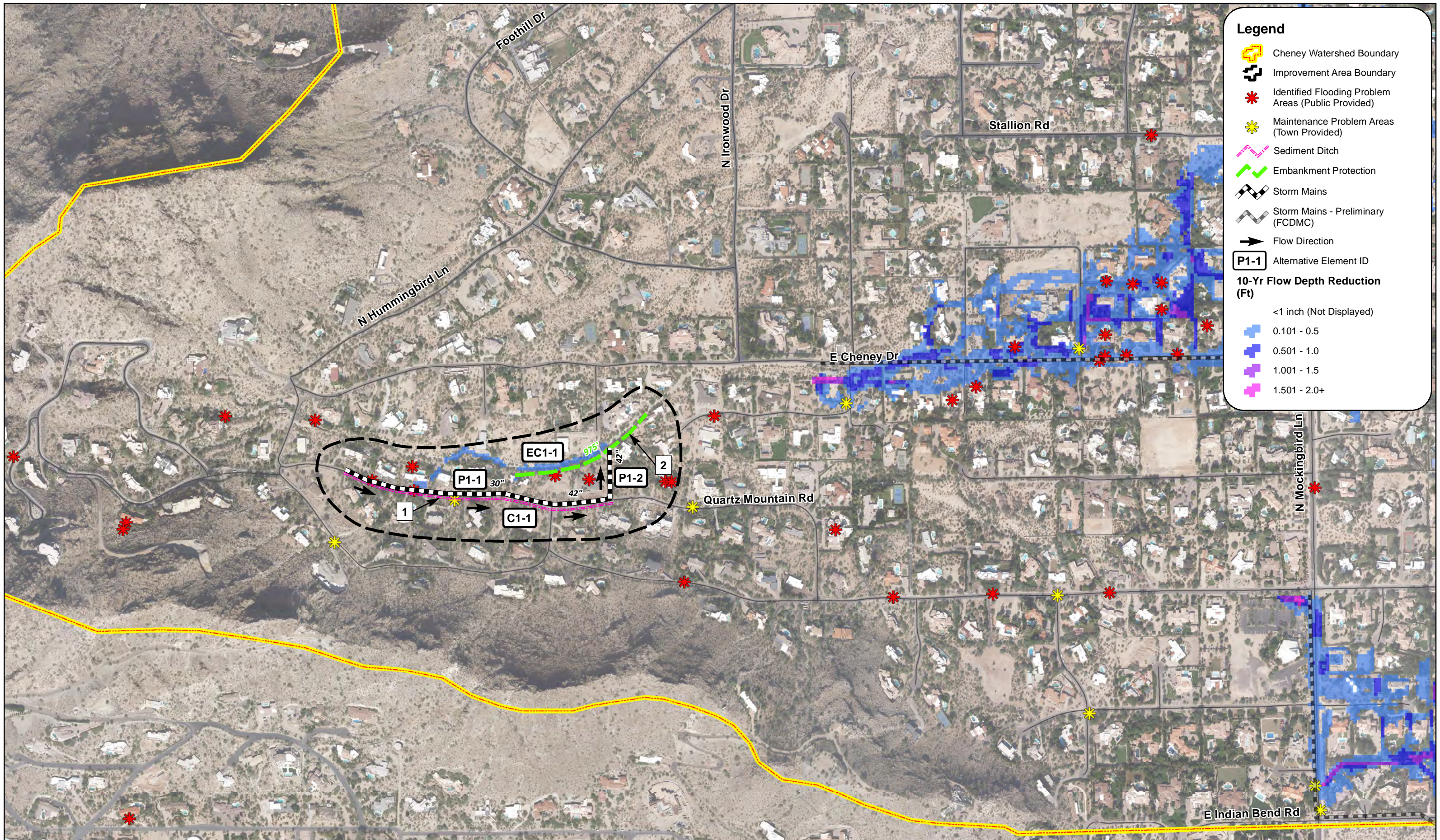
10-Yr Flow Depth Reduction (Ft)

- <1 inch (Not Displayed)
- 0.101 - 0.5
- 0.501 - 1.0
- 1.001 - 1.5
- 1.501 - 2.0+



Legend

- Cheney Watershed Boundary
- Improvement Area Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sediment Ditch
- Embankment Protection
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
- Alternative Element ID
- 10-Yr Flow Depth Reduction (Ft)**
 - <1 inch (Not Displayed)
 - 0.101 - 0.5
 - 0.501 - 1.0
 - 1.001 - 1.5
 - 1.501 - 2.0+



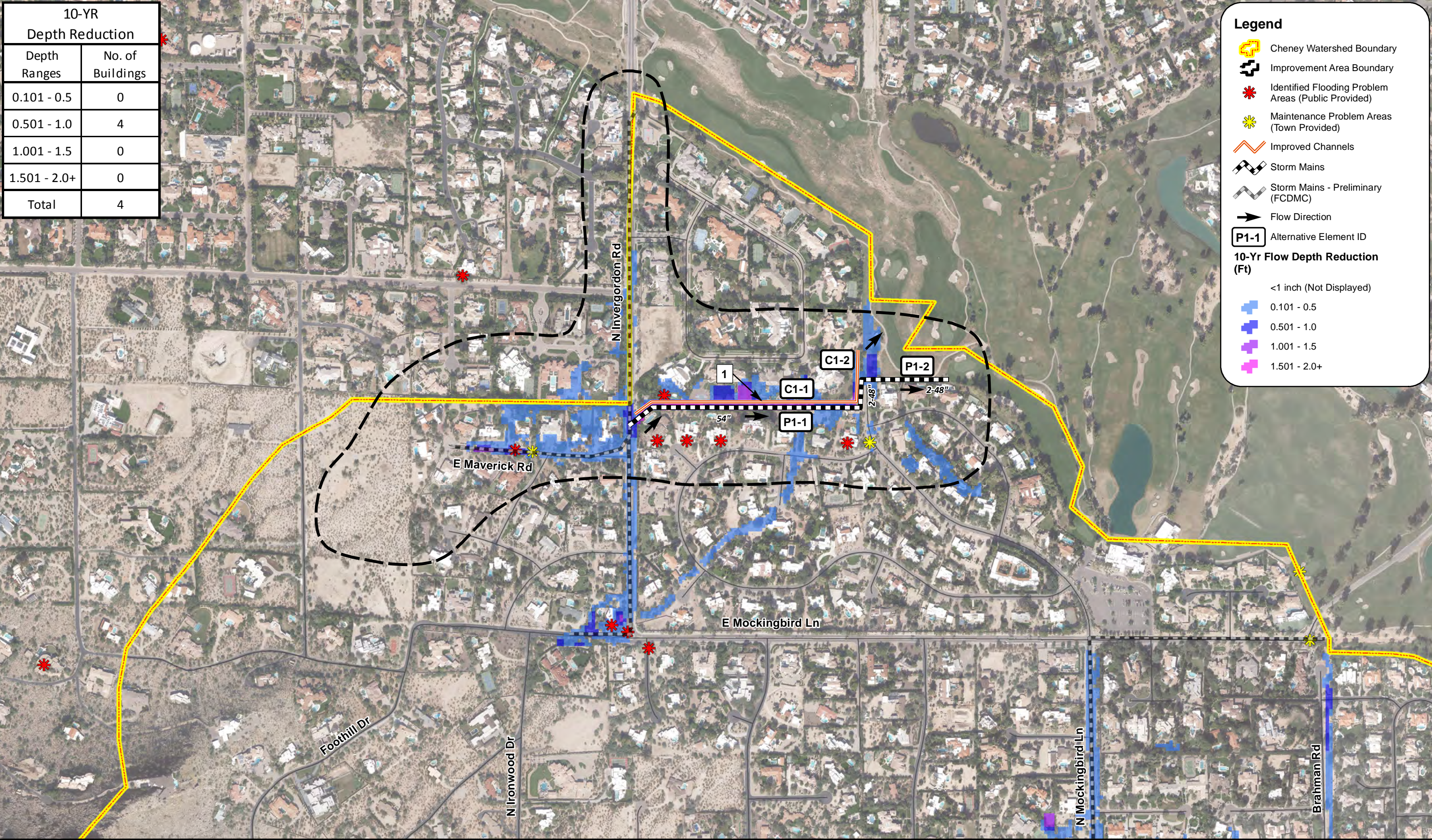
Legend

- Cheney Watershed Boundary
- Improvement Area Boundary
- Identified Flooding Problem Areas (Public Provided)
- Maintenance Problem Areas (Town Provided)
- Sediment Ditch
- Embankment Protection
- Storm Mains
- Storm Mains - Preliminary (FCDMC)
- Flow Direction
- Alternative Element ID

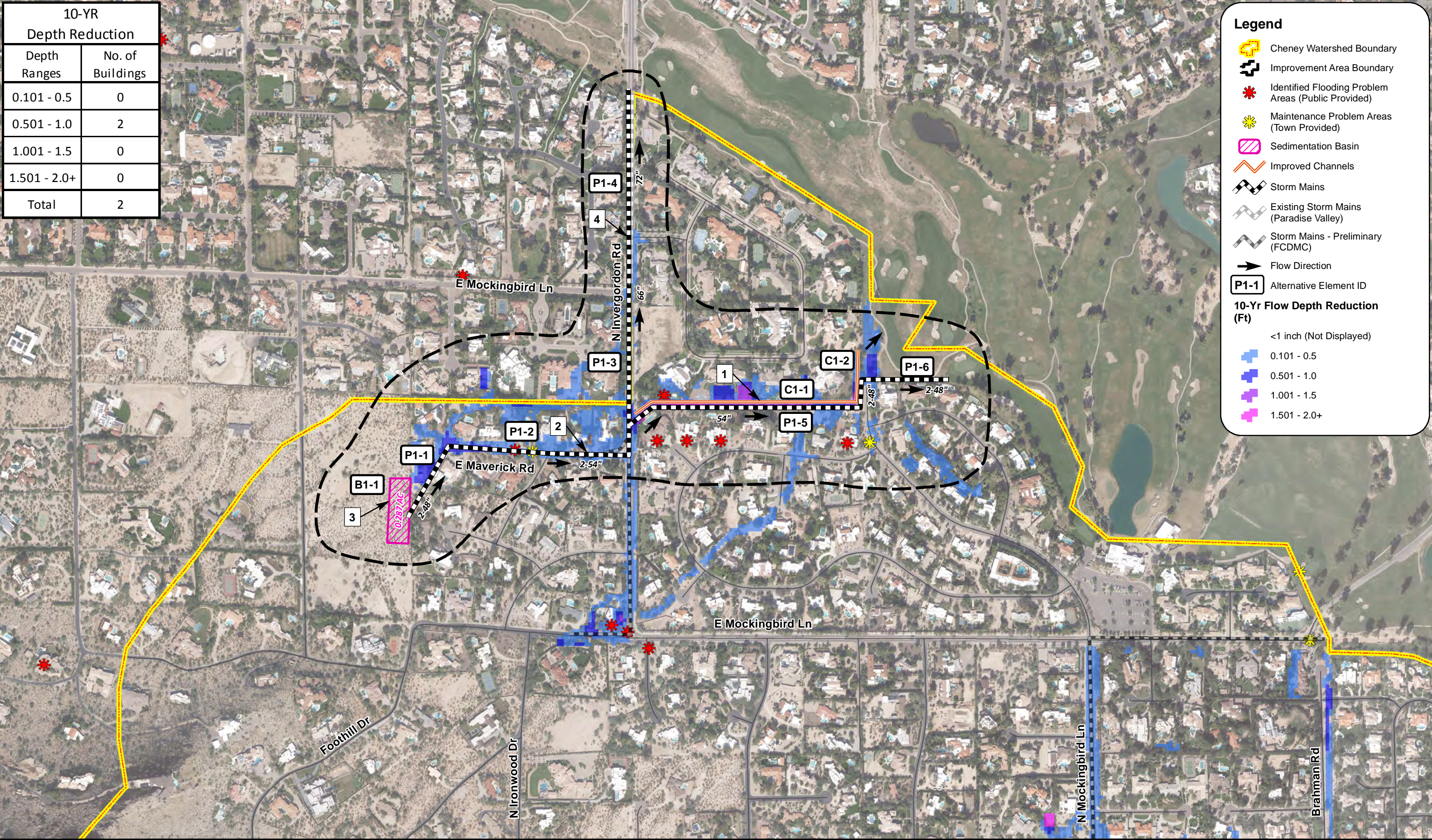
10-Yr Flow Depth Reduction (Ft)

- <1 inch (Not Displayed)
- 0.101 - 0.5
- 0.501 - 1.0
- 1.001 - 1.5
- 1.501 - 2.0+

10-YR Depth Reduction	
Depth Ranges	No. of Buildings
0.101 - 0.5	0
0.501 - 1.0	4
1.001 - 1.5	0
1.501 - 2.0+	0
Total	4



10-YR Depth Reduction	
Depth Ranges	No. of Buildings
0.101 - 0.5	0
0.501 - 1.0	2
1.001 - 1.5	0
1.501 - 2.0+	0
Total	2



Appendix F: Facility Sizing & Cost Calculations

Paradise Valley Watershed Studies - Cheney Watershed

Utility Crossing Summary
Milestone: Alternatives Analysis

Existing Utility Potential Tranverse Conflicts (Each)																
Alternative	Facility Element ID	Sewer	Water				TV/Communications		Natural Gas			Electric		Potential Relocation Cost	Relocation Cost Contingency	Total Relocation Cost
		Sewer 8"	Water 4"	Water 6"	Water 8"	Water 12"	COX F.O.	CenturyLink F.O.	Gas <= 4"	Gas>4"	H.P. Gas	Electric	H.V. Electric			
		\$30,000	\$3,000	\$4,000	\$5,000	\$6,000	\$10,000	\$10,000	\$2,000	\$6,000	\$25,000	\$5,000	\$100,000			
Cheney 1	B1-1								2			2		\$14,000	\$4,200	\$18,200
	LID1-1													\$0	\$0	\$0
	C1-1	1					1					2		\$50,000	\$15,000	\$65,000
	C2-1	1			2		1		1			2		\$52,000	\$15,600	\$67,600
	P1-1	1		5			3	1	5			2		\$110,000	\$33,000	\$143,000
	P1-2													\$0	\$0	\$0
	P1-3	2		2		1	5	1	7			9		\$193,000	\$57,900	\$250,900
	P2-1	1		1			2	1	4			2		\$82,000	\$24,600	\$106,600
	P3-1						1		2			4		\$34,000	\$10,200	\$44,200
Cheney 2	P4-1						1		1			3		\$27,000	\$8,100	\$35,100
	P4-2	1		1			1		2			2		\$58,000	\$17,400	\$75,400
	B1-1								2			2		\$14,000	\$4,200	\$18,200
	LID1-1													\$0	\$0	\$0
	C1-1	1					1					2		\$50,000	\$15,000	\$65,000
	C2-1	1			2		1		1			2		\$52,000	\$15,600	\$67,600
	P1-1	1		5			3	1	5			2		\$110,000	\$33,000	\$143,000
	P1-2													\$0	\$0	\$0
	P1-3	2		2		1	5	1	7			9		\$193,000	\$57,900	\$250,900
Cheney 3	P1-4	2		1	1		3	1	3			8		\$150,000	\$45,000	\$195,000
	P1-5	3		1			3	3	4			2		\$172,000	\$51,600	\$223,600
	P2-1						1		2			4		\$34,000	\$10,200	\$44,200
	P3-1						1		1			3		\$27,000	\$8,100	\$35,100
	P3-2	1		1			1		2			2		\$58,000	\$17,400	\$75,400
	B1-1								2			2		\$14,000	\$4,200	\$18,200
		1					1					2		\$50,000	\$15,000	\$65,000
		1			2		1		1			2		\$52,000	\$15,600	\$67,600
	C1-1			1	1	1	4	4	6			7		\$137,002	\$41,101	\$178,103
Mockingbird 1 & 2	C1-2	1		2		1	3	3	6			7		\$151,000	\$45,300	\$196,300
	C1-3	1	1			1	3	1	6			5		\$116,000	\$34,800	\$150,800
	C1-4		1	1	2		3	4	2	1	1	4	1	\$232,000	\$69,600	\$301,600
	P1-1	1		1			2	1	4			2		\$82,000	\$24,600	\$106,600
	P2-1						1		2			4		\$34,000	\$10,200	\$44,200
	P3-1						1		1			3		\$27,000	\$8,100	\$35,100
	P3-2	1		1			1		2			2		\$58,000	\$17,400	\$75,400
	P1-1	1		1			4	2	4			4		\$122,000	\$36,600	\$158,600
	B1-1											1		\$5,000	\$1,500	\$6,500
Mockingbird 3 & 4	B1-2													\$0	\$0	\$0
	P1-1						1	3	1					\$42,000	\$12,600	\$54,600
	C1-1						1	3	1					\$42,000	\$12,600	\$54,600
Quartz Mtn 1, 2 & 3	B1-1													\$0	\$0	\$0
	P1-1		1				5	1	10			8		\$123,000	\$36,900	\$159,900
	P1-2						1	1				1		\$25,000	\$7,500	\$32,500
	C1-1													\$0	\$0	\$0
Maverick 1	EC1-1													\$0	\$0	\$0
	P1-1	2					1	1	8					\$96,000	\$28,800	\$124,800
	P1-2											2		\$10,000	\$3,000	\$13,000
	C1-1								8					\$16,000	\$4,800	\$20,800
Maverick 2	C1-2													\$0	\$0	\$0
	P1-1						1							\$10,000	\$3,000	\$13,000
	P1-2			1	1		2	2	4			2		\$62,000	\$18,600	\$80,600
	P1-3	1					2	2	2			1		\$79,000	\$23,700	\$102,700
	P1-4	1		1	1		1	1						\$54,000	\$16,200	\$70,200
	P1-5	2					1	1	8					\$96,000	\$28,800	\$124,800
	P1-6											2		\$10,000	\$3,000	\$13,000
Total per Utility	C1-1								8					\$16,000	\$4,800	\$20,800
	C1-2													\$0	\$0	\$0

Paradise Valley Watershed Studies - Cheney Watershed

Utility Crossing Summary
Milestone: Alternatives Analysis

Existing Utility Potential Parallel Conflicts (Linear Foot)																
Alternative	Facility Element ID	Sewer	Water				TV/Communications		Natural Gas			Electric		Potential Relocation Cost	Relocation Cost Contingency	Total Relocation Cost
		Sewer 8"	Water 4"	Water 6"	Water 8"	Water 12"	COX F.O.	CenturyLink F.O.	Gas <= 4"	Gas>4"	H.P. Gas	Electric	H.V. Electric			
		N/A	\$100	\$110	\$130	\$150	\$100	\$100	\$25	\$35	\$500	\$100	N/A			
Cheney 1	B1-1													\$0	\$0	\$0
	LID1-1													\$0	\$0	\$0
	C1-1													\$0	\$0	\$0
	C2-1													\$0	\$0	\$0
	P1-1													\$0	\$0	\$0
	P1-2													\$0	\$0	\$0
	P1-3													\$0	\$0	\$0
	P2-1													\$0	\$0	\$0
	P3-1													\$0	\$0	\$0
	P4-1													\$0	\$0	\$0
P4-2													\$0	\$0	\$0	
Cheney 2	B1-1													\$0	\$0	\$0
	LID1-1													\$0	\$0	\$0
	C1-1													\$0	\$0	\$0
	C2-1													\$0	\$0	\$0
	P1-1													\$0	\$0	\$0
	P1-2													\$0	\$0	\$0
	P1-3													\$0	\$0	\$0
	P1-4													\$0	\$0	\$0
	P1-5													\$0	\$0	\$0
	P2-1													\$0	\$0	\$0
	P3-1													\$0	\$0	\$0
	P3-2													\$0	\$0	\$0
Cheney 3	B1-1													\$0	\$0	\$0
	C1-1													\$0	\$0	\$0
	C2-1													\$0	\$0	\$0
	C3-1													\$0	\$0	\$0
	C3-2													\$0	\$0	\$0
	C3-3													\$0	\$0	\$0
	C3-4													\$0	\$0	\$0
	P1-1													\$0	\$0	\$0
	P2-1													\$0	\$0	\$0
	P3-1													\$0	\$0	\$0
P3-2													\$0	\$0	\$0	
Mockingbird 1 & 2	P1-1													\$0	\$0	\$0
	B1-1													\$0	\$0	\$0
	B1-2													\$0	\$0	\$0
Mockingbird 3 & 4	P1-1													\$0	\$0	\$0
	C1-1													\$0	\$0	\$0
	B1-1													\$0	\$0	\$0
Quartz Mtn 1, 2 & 3	P1-1								500			500		\$62,500	\$18,750	\$81,250
	P1-2													\$0	\$0	\$0
	C1-1							1,200						\$120,000	\$36,000	\$156,000
	EC1-1													\$0	\$0	\$0
Maverick 1	P1-1							1,300	880					\$152,000	\$45,600	\$197,600
	P1-2													\$0	\$0	\$0
	C1-1								880					\$22,000	\$6,600	\$28,600
	C1-2													\$0	\$0	\$0
Maverick 2	P1-1													\$0	\$0	\$0
	P1-2													\$0	\$0	\$0
	P1-3													\$0	\$0	\$0
	P1-4													\$0	\$0	\$0
	P1-5							1,300	880					\$152,000	\$45,600	\$197,600
	P1-6													\$0	\$0	\$0
	C1-1								880					\$22,000	\$6,600	\$28,600
	C1-2													\$0	\$0	\$0
Total per Utility		0	0	0	0	0	0	3,800	4,020	0	0	500	0			

Paradise Valley Watershed Studies - Cheney Watershed

Preliminary Storm Drain Sizing and Cost Estimation

Milestone: Alternatives Analysis

PRELIMINARY STORM DRAIN DESIGN AND COSTS

Alternative Name	Alternative Element ID	Length (ft)	Number of Pipes	Diameter (in)	Manning's N Value	QDesign (cfs)	Qfull (cfs)	Velocity (ft/s)	Friction Slope (ft/ft)	Unit Cost Pipe, Exc. & Backfill (\$/LF)	Pipe, Exc. & Backfill Cost	Unit Cost Surface Replacement (\$/sf)	Surface Replacement	Trunkline Manholes	Unit Cost per Manhole	Trunkline Manholes Cost	Lateral Pipes/Inlets	Lateral/Collector Pipes/Inlets	Lateral/Collector Pipe Pavment Replacement	Lateral/Collector Pipes/Inlets Cost	Required Land Acquisition (sf.)	Zoning	Unit Cost (\$/sf)	Land Acquisition Cost	Miscellaneous Removals & Relocations Unit Cost (\$/SF)	Miscellaneous Removals & Relocations Cost	Total Construction Cost	Total Contingencies Cost	Total Constuction and Contingency	Total Construcion, Contingencies, and Land Costs
Cheney 1	P1-1	1291	1	48	0.014	99	119	7.9	0.0080	168	\$216,888	\$10	\$154,920	4	\$7,000	\$29,400	3.2	4	\$24,000	\$80,960	12000	RES	\$26	\$312,000	\$0.30	\$3,600	\$485,768	145,730	631,498	\$943,498
Cheney 1	P1-2	187	1	24	0.014	5	12	1.6	0.0030	104	\$19,448	\$10	\$18,700	2	\$7,000	\$11,200	0.5	1	\$6,000	\$20,240						\$69,588	20,876	90,464	\$90,464	
Cheney 1	P1-3	1310	1	48	0.014	99	133	7.9	0.0100	168	\$220,080	\$10	\$157,200	4	\$7,000	\$30,100	3.3	4	\$24,000	\$80,960						\$488,340	146,502	634,842	\$634,842	
Cheney 1	P2-1	1366	2	60	0.014	305	319	7.8	0.0044	200	\$546,400	\$10	\$245,880	4	\$7,000	\$30,800	3.4	4	\$24,000	\$80,960						\$904,040	271,212	1,175,252	\$1,175,252	
Cheney 1	P3-1	435	1	30	0.014	25	25	5.1	0.0041	122	\$53,070	\$10	\$45,675	3	\$7,000	\$17,500	1.1	2	\$12,000	\$40,480						\$156,725	47,018	203,743	\$203,743	
Cheney 1	P4-1	759	1	30	0.014	26	30	5.3	0.0060	122	\$92,598	\$10	\$79,695	4	\$7,000	\$24,500	1.9	3	\$18,000	\$60,720	11200	RES	\$26	\$291,200	\$0.30	\$3,360	\$257,513	77,254	334,767	\$625,967
Cheney 1	P4-2	1246	1	30	0.014	26	30	5.3	0.0060	122	\$152,012	\$10	\$130,830	5	\$7,000	\$36,400	3.1	4	\$24,000	\$80,960						\$400,202	120,061	520,263	\$520,263	
Cheney 2	P1-1	1291	1	66	0.014	245	278	10.3	0.0080	225	\$290,475	\$10	\$174,285	4	\$7,000	\$29,400	3.2	4	\$24,000	\$80,960	12000	RES	\$26	\$312,000	\$0.30	\$3,600	\$575,120	172,536	747,656	\$1,059,656
Cheney 2	P1-2	187	1	24	0.014	5	12	1.6	0.0030	104	\$19,448	\$10	\$18,700	2	\$7,000	\$11,200	0.5	1	\$6,000	\$20,240						\$69,588	20,876	90,464	\$90,464	
Cheney 2	P1-3	1310	1	66	0.014	245	312	10.3	0.0100	225	\$294,750	\$10	\$176,850	4	\$7,000	\$30,100	3.3	4	\$24,000	\$80,960						\$582,660	174,798	757,458	\$757,458	
Cheney 2	P1-4	1324	2	72	0.014	550	562	9.7	0.0051	250	\$662,000	\$10	\$264,800	4	\$7,000	\$30,100	3.3	4	\$24,000	\$80,960						\$1,037,860	311,358	1,349,218	\$1,349,218	
Cheney 2	P1-5	1909	2	72	0.014	550	627	9.7	0.0064	250	\$954,500	\$10	\$381,800	6	\$7,000	\$40,600	4.8	6	\$36,000	\$121,440						\$1,498,340	449,502	1,947,842	\$1,947,842	
Cheney 2	P2-1	435	1	30	0.014	25	25	5.1	0.0041	122	\$53,070	\$10	\$45,675	3	\$7,000	\$17,500	1.1	2	\$12,000	\$40,480						\$156,725	47,018	203,743	\$203,743	
Cheney 2	P3-1	759	1	30	0.014	26	30	5.3	0.0060	122	\$92,598	\$10	\$79,695	4	\$7,000	\$24,500	1.9	3	\$18,000	\$60,720	11200	RES	\$26	\$291,200	\$0.30	\$3,360	\$257,513	77,254	334,767	\$625,967
Cheney 2	P3-2	1246	1	30	0.014	26	30	5.3	0.0060	122	\$152,012	\$10	\$130,830	5	\$7,000	\$36,400	3.1	4	\$24,000	\$80,960						\$400,202	120,061	520,263	\$520,263	
Cheney 3	P3-1	759	1	30	0.014	26	30	5.3	0.0060	122	\$92,598	\$10	\$79,695	4	\$7,000	\$24,500	1.9	3	\$18,000	\$60,720	11200	RES	\$26	\$291,200	\$0.30	\$3,360	\$257,513	77,254	334,767	\$625,967
Cheney 3	P3-2	1246	1	30	0.014	26	30	5.3	0.0060	122	\$152,012	\$10	\$130,830	5	\$7,000	\$36,400	3.1	4	\$24,000	\$80,960						\$400,202	120,061	520,263	\$520,263	
Cheney 3	P1-1	1366	2	60	0.014	305	319	7.8	0.0044	200	\$546,400	\$10	\$245,880	4	\$7,000	\$30,800	3.4	4	\$24,000	\$80,960						\$904,040	271,212	1,175,252	\$1,175,252	
Cheney 3	P2-1	435	1	30	0.014	25	25	5.1	0.0041	122	\$53,070	\$10	\$45,675	3	\$7,000	\$17,500	1.1	2	\$12,000	\$40,480						\$156,725	47,018	203,743	\$203,743	
Maverick 1	P1-1	1183	1	54	0.014	107	129	6.7	0.0050	185	\$218,855	\$10	\$147,875	4	\$7,000	\$28,000	3.0	4	\$24,000	\$80,960	23660	RES	\$26	\$615,160	\$0.30	\$7,098	\$475,690	142,707	618,397	\$1,233,557
Maverick 1	P1-2	777	2	48	0.014	151	179	6.0	0.0045	168	\$261,072	\$10	\$124,320	3	\$7,000	\$20,300	1.9	3	\$18,000	\$60,720	14340	RES	\$26	\$372,840	\$0.30	\$4,302	\$466,412	139,924	606,336	\$979,176
Maverick 2	P1-1	411	2	48	0.014	217	217	8.6	0.0066	168	\$138,096	\$10	\$65,760	2	\$7,000	\$14,000	1.0	2	\$12,000	\$40,480	6200	RES	\$26	\$161,200	\$0.30	\$1,860	\$258,336	77,501	335,837	\$497,037
Maverick 2	P1-2	1057	2	54	0.014	239	297	7.5	0.0066	185	\$391,090	\$10	\$179,690	4	\$7,000	\$25,200	2.6	4	\$24,000	\$80,960						\$676,940	203,082	880,022	\$880,022	
Maverick 2	P1-3	1183	1	66	0.014	179	179	7.5	0.0033	225	\$266,175	\$10	\$159,705	4	\$7,000	\$28,000	3.0	4	\$24,000	\$80,960						\$534,840	160,452	695,292	\$695,292	
Maverick 2	P1-4	1466	1	72	0.014	179	205	6.3	0.0027	250	\$366,500	\$10	\$205,240	5	\$7,000	\$32,900	3.7	5	\$30,000	\$101,200						\$705,840	211,752	917,592	\$917,592	
Maverick 2	P1-5	1183	1	54	0.014	125	129	7.9	0.0050	185	\$218,855	\$10	\$147,875	4	\$7,000	\$28,000	3.0	4	\$24,000	\$80,960	23660	RES	\$26	\$615,160	\$0.30	\$7,098	\$475,690	142,707	618,397	\$1,233,557
Maverick 2	P1-6	777	2	48	0.014	169	179	6.7	0.0045	168	\$261,072	\$10	\$124,320	3	\$7,000	\$20,300	1.9	3	\$18,000	\$60,720	14340	RES	\$26	\$372,840	\$0.30	\$4,302	\$466,412	139,924	606,336	\$979,176
Mockingbird 1	P1-1	395	1	48	0.014	100	120	8.0	0.0081	168	\$66,360	\$10	\$47,400	2	\$7,000	\$14,000	1.0	2	\$12,000	\$40,480						\$168,240	50,472	218,712	\$218,712	
Mockingbird 2	P1-1	395	1	54	0.014	146	164	9.2	0.0081	185	\$73,075	\$10	\$49,375	2	\$7,000	\$14,000	1.0	2	\$12,000	\$40,480						\$176,930	53,079	230,009	\$230,009	
Mockingbird 3	P1-1	1405	1	42	0.014	75	77	7.8	0.0068	135	\$189,675	\$10	\$161,575	5	\$7,000	\$31,500	3.5	5	\$30,000	\$101,200	26800	RES	\$26	\$696,800	\$0.30	\$8,040	\$483,950	145,185	629,135	\$1,325,935
QuartzMtn 1	P1-1	1207	1	24	0.014	35	40	11.1	0.0370	104	\$125,528	\$10	\$120,700	5	\$7,000	\$35,000	8.0	9	\$54,000	\$175,680						\$456,908	137,072	593,980	\$593,980	
QuartzMtn 1	P1-2	651	1	30	0.014	78	89	15.9	0.0547	122	\$79,422	\$10	\$68,355	3	\$7,000	\$22,400	1.6	3	\$18,000	\$58,560	5400	RES	\$26	\$140,400	\$0.30	\$1,620	\$228,737	68,621	297,358	\$437,758
QuartzMtn 2	P1-1	1207	1	30	0.014	50	73	10.2	0.0370	122	\$147,254	\$10	\$126,735	5	\$7,000	\$35,000	8.0	9	\$54,000	\$182,160						\$491,149	147,345	638,494	\$638,494	
QuartzMtn 2	P1-2	651	1	36	0.014	124	145	17.5	0.0547	130	\$84,630	\$10	\$71,610	3	\$7,000	\$18,200	1.6	3	\$18,000	\$60,720	5400	RES	\$26	\$140,400	\$0.30	\$1,620	\$235,160	70,548	305,708	\$446,108
QuartzMtn 3	P1-1	1207	1	30	0.014	62	73	12.6	0.0370	122	\$147,254	\$10	\$126,735	5	\$7,000	\$35,000	8.0	9	\$54,000	\$191,880						\$500,869	150,261	651,130	\$651,130	
QuartzMtn 3	P1-2	651	1	42	0.014	153	218	15.9	0.0547	135	\$87,885	\$10	\$74,865	3	\$7,000	\$18,200														

* Represents an element provided by a FCDMC facility or an upsizing of a FCDMC facility.

Paradise Valley Watershed Studies - Cheney Watershed

Preliminary Channel Sizing and Cost Estimation

Milestone: Alternatives Analysis

Preliminary Channel Design																																							
Alternative Name	Alternative Element ID	DS Ground Elevation (ft)	US Ground Elevation (ft)	DS Channel Depth (ft)	US Channel Depth (ft)	Computed Natural Ground Slope (ft/ft)	Design Flowrate (cfs)	Downstream Invert Elevation (ft)	Upstream Invert Elevation (ft)	Length (ft)	Design Invert Slope (ft./ft.)	Ground Slope Differential (ft.)	No. of Drops	Vertical Drop Height(ft.)	Material Type (C, E, GR, LE, R, SC, or CR) *	Manning's "n" Value	Bottom Width, W (ft)	Depth of Flow(ft)	Sideslope (H:1) Left (HL)	Sideslope (H:1) Right (HR)	Area (sf)	Froude Number	Type of Flow	Velocity (fps)	Design Depth (ft)	Channel Topwidth Min (ft)	Channel Topwidth Max (ft)	Conveyance Excavated Volume (cy)	Lining Thickness (ft)	Lining Section Area (SF)	Lining Excavation Volume (CY)	Number of Culverts (No.)	Vertical Drop Structures (No.)	Access Width (ft)	Total Corridor Width-Channel+Access(Max, ft)	Existing Available Right-of-Way Width (Average, ft.)	New Right-of-Way Width Required (Average, ft.)	Est. Required Land Acquisition (Ac.)	
Cheney 1	C1-1	1342.20	1378.40	2.6	16.1	0.0239	215	1339.63	1362.32	1513	0.0150	13.5	14	1.0	LE	0.040	4.0	2.6	4	4	36.8	0.84	Sub	5.8	2.6	25	32.295	2,828	-	-	-	8	6	6	38	38	0	0.000	
Cheney 1	C1-2	1321.80	1342.20	2.8	8.6	0.0154	215	1319.05	1333.61	1324	0.0110	5.8	7	0.8	LE	0.040	4.0	2.8	4	4	41.3	0.73	Sub	5.2	2.8	26	32.67	2,623	-	-	-	7	0	6	39	31	7	0.213	
Cheney 1	C1-3	1307.40	1321.80	3.1	8.9	0.0109	215	1304.32	1312.94	1326	0.0065	5.8	7	0.8	LE	0.040	4.0	3.1	4	4	50.2	0.57	Sub	4.3	3.1	29	35.234	3,114	-	-	-	7	0	2	37	26	11	0.335	
Cheney 1	C1-4	1296.23	1307.40	2.9	3.4	0.0092	215	1293.34	1303.98	1209	0.0088	0.5	1	0.5	LE	0.040	4.0	2.9	4	4	44.8	0.66	Sub	4.8	2.9	27	31.33	2,355	-	-	-	1	0	2	33	21	13	0.361	
QuartzMtn 1	C-1									1207					CR													823	1.0	17.08	764	-	0	0	18		5	0.139	
QuartzMtn 2	C-1									1207					CR													823	1.0	17.08	764	-	0	0	18		5	0.139	
QuartzMtn 3	C-1									1207					CR													823	1.0	17.08	764	-	0	0	18		5	0.139	

* Note: C = concrete, E = earth, GR = grass, LE = landscaped earth, R = riprap, SC = shotcrete, CR = grouted rock

Paradise Valley Watershed Studies - Cheney Watershed

Preliminary Channel Sizing and Cost Estimation

Milestone: Alternatives Analysis

Preliminary Channel Cost																												
Alternative Name	Alternative Element ID	Length (ft)	Material Type (C, E, GR, LE, R, SC, or CR) *	Conveyance Excavated Volume (cy)	Lining Excavation Volume (CY)	Total Excavation Volume (CY)	Excavation Unit Cost (\$/ft^3)	Total Excavation Cost	Lining Unit Cost (\$/yd^3)	Lining Cost	Vertical Drop Structures (No.)	Drop Structure Unit Cost (Ea)	Drop Structure Cost	Access Width (ft)	New Right-of-Way Width Required (Average, ft.)	Est. Required Land Acquisition (Ac.)	Zoning	Unit Cost (\$/sf)	Land Acquisition Cost	Miscellaneous Removals & Relocations Unit Cost (\$/SF)	Miscellaneous Removals & Relocations Cost	Landscape Area (sf)	Landscape Unit Cost (\$/sf)	Total Landscape Cost	Total Construction & Landscape Cost	Contingencies Cost	Total Constructin and Contingency	Total Construction, Contingencies, Land, & Landscape Costs
Cheney 1	C1-1	1513	LE	2,828	-	2,828	\$6.00	\$16,969		-	6	\$30,000	\$180,000	6	0	0.000	Res	\$26.00	\$0	\$0.30	\$17,382	30046	\$2	\$60,091	\$274,442	\$82,332	\$356,774	\$356,774
Cheney 1	C1-2	1324	LE	2,623	-	2,623	\$6.00	\$15,739		-	0	\$30,001	\$0	6	7	0.213	Res	\$26.00	\$240,968	\$0.30	\$15,361	29943	\$2	\$59,885	\$90,985	\$27,296	\$118,281	\$359,249
Cheney 1	C1-3	1326	LE	3,114	-	3,114	\$6.00	\$18,683		-	0	\$30,002	\$0	2	11	0.335	Res	\$26.00	\$379,236	\$0.30	\$14,812	27775	\$2	\$55,551	\$89,045	\$26,714	\$115,759	\$494,995
Cheney 1	C1-4	1209	LE	2,355	-	2,355	\$6.00	\$14,131		-	0	\$30,003	\$0	2	13	0.361	Res	\$26.00	\$408,642	\$0.30	\$12,089	26283	\$2	\$52,566	\$78,786	\$23,636	\$102,422	\$511,064
QuartzMtn 1	C1-1	1207	CR	823	764	1,586	\$6.00	\$9,517	\$200	\$152,708	0	\$30,003	\$0	0	5	0.139	Res	\$26.00	\$156,910	\$0.30	\$6,518		\$2	\$0	\$168,742	\$50,623	\$219,365	\$376,275
QuartzMtn 2	C1-1	1207	CR	823	764	1,586	\$6.00	\$9,517	\$200	\$152,708	0	\$30,003	\$0	0	5	0.139	Res	\$26.00	\$156,910	\$0.30	\$6,518		\$2	\$0	\$168,742	\$50,623	\$219,365	\$376,275
QuartzMtn 3	C1-1	1207	CR	823	764	1,586	\$6.00	\$9,517	\$200	\$152,708	0	\$30,003	\$0	0	5	0.139	Res	\$26.00	\$156,910	\$0.30	\$6,518		\$2	\$0	\$168,742	\$50,623	\$219,365	\$376,275

* Note: C = concrete, E = earth, GR = grass, LE = landscaped earth, R = riprap, SC = shotcrete, CR = grouted rock

Paradise Valley Watershed Studies - Cheney Watershed
Preliminary Channel Sizing and Cost Estimation
Milestone: Alternatives Analysis

Preliminary Culvert Cost																															
Alternative Name	Alternative Element ID	No. of 20' Driveway Culverts	Size of 20' Driveway Culverts	Unit Cost of 20' Driveway Culverts (\$/lf)	20' Driveway Inlet/Outlet Wingwall (No.)	Unit Cost Inlet/Outlet Wingwall (\$/Ea)	20' Driveway Culvert and Inlet/Outlet Wingwall Cost	No. of 40' Local Road Culverts	Size of 40' Local Road Culverts	Unit Cost of 40' Local Road Culverts (\$/lf)	40' Local Road Inlet/Outlet Wingwall (No.)	Unit Cost Inlet/Outlet Wingwall (\$/Ea)	40' Local Road Culvert and Inlet/Outlet Wingwall Cost	No. of 100' Collector Road Culverts	Size of 100' Collector Road Culverts	Unit Cost of 100' Collector Road Culverts (\$/lf)	100' Collector Road Inlet/Outlet Wingwall (No.)	Unit Cost Inlet/Outlet Wingwall (\$/Ea)	100' Collector Road Culvert and Inlet/Outlet Wingwall Cost	No. of Arterial Road Culverts	Size of Arterial Road Culverts	Unit Cost of Arterial Road Culverts (\$/lf)	Arterial Road Inlet/Outlet Wingwall (No.)	Unit Cost Inlet/Outlet Wingwall (\$/Ea)	Arterial Road Culvert and Inlet/Outlet Wingwall Cost	Surface Replacement Area (SF)	Unit Cost of Surface Replacement (\$/sf)	Total Surface Replacement Cost	Total Construction & Surface Replacement Cost	Contingencies Cost	Total Construction, Contingencies, Surface Replacement Costs
Cheney 1	C1-1	7	(2) 6'x3'	\$700	14	\$4,500	\$161,000	1	(2) 6'x3'	\$700	2	\$4,500	\$37,000		(2) 6'x3'	\$700	0	\$4,500	\$0						\$0	13725	\$10	\$137,252	\$335,252	\$100,576	\$435,828
Cheney 1	C1-2	6	(2) 6'x3'	\$700	12	\$4,500	\$138,000		(2) 6'x3'	\$700	0	\$4,500	\$0	1	(2) 6'x3'	\$700	2	\$4,500	\$79,000						\$0	15847	\$10	\$158,466	\$375,466	\$112,640	\$488,106
Cheney 1	C1-3	5	(2) 6'x3'	\$700	10	\$4,500	\$115,000	2	(2) 6'x3'	\$700	4	\$4,500	\$74,000		(2) 6'x3'	\$700	0	\$4,500	\$0						\$0	16384	\$10	\$163,836	\$352,836	\$105,851	\$458,687
Cheney 1	C1-4		(2) 6'x3'	\$700	0	\$4,500	\$0	1	(2) 6'x3'	\$700	2	\$4,500	\$37,000		(2) 6'x3'	\$700	0	\$4,500	\$0	1	(2) 8'x3'	\$850	2	\$6,500	\$340,250	13347	\$10	\$133,467	\$510,717	\$153,215	\$663,932
QuartzMtn 1	C1-4				0		\$0				0		\$0				0		\$0						\$0	0		\$0	\$0	\$0	\$0
QuartzMtn 2	C1-4				0		\$0				0		\$0				0		\$0						\$0	0		\$0	\$0	\$0	\$0
QuartzMtn 3	C1-4				0		\$0				0		\$0				0		\$0						\$0	0		\$0	\$0	\$0	\$0

Paradise Valley Watershed Studies - Cheney Watershed

Preliminary Culvert Sizing

Milestone: Alternatives Analysis

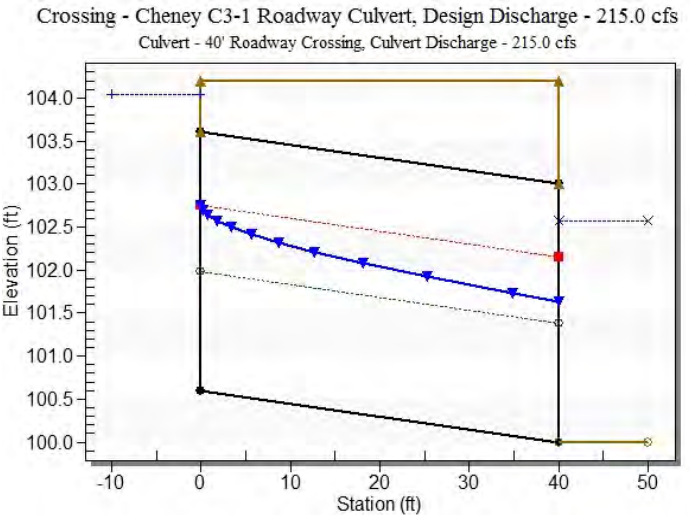
ALTERNATIVE CHENEY 3 - CHANNEL C3-1

Table 1 - Culvert Summary Table: 40' Roadway Crossing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	100.60	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
50.00	50.00	101.91	1.308	0.776	1-JS1t	0.525	0.814	1.333	1.333	3.125	4.018
100.00	100.00	102.63	2.029	1.405	1-S2n	0.823	1.292	0.928	1.834	8.975	4.810
150.00	150.00	103.25	2.651	1.982	1-S2n	1.078	1.693	1.250	2.197	9.996	5.337
200.00	200.00	103.86	3.259	2.577	5-S2n	1.310	2.051	1.547	2.493	10.776	5.743
215.00	215.00	104.05	3.445	2.763	5-S2n	1.377	2.152	1.633	2.572	10.971	5.850
300.00	250.25	104.50	3.902	3.440	5-S2n	1.529	2.381	1.827	2.969	11.417	6.365
350.00	260.70	104.64	4.043	3.732	5-JS1f	1.573	2.447	3.000	3.170	7.242	6.619
400.00	269.71	104.77	4.168	4.010	5-S1f	1.611	2.503	3.000	3.355	7.492	6.846
450.00	277.97	104.89	4.285	4.247	5-JS1f	1.645	2.554	3.000	3.525	7.721	7.052
500.00	285.55	104.99	4.394	4.479	4-FFF	1.677	2.600	3.000	3.685	7.932	7.242

Straight Culvert
Inlet Elevation (invert): 100.60 ft,
Outlet Elevation (invert): 100.00 ft
Culvert Length: 40.00 ft,
Culvert Slope: 0.0150

Water Surface Profile Plot for Culvert: 40' Roadway Crossing



Site Data - 40' Roadway Crossing

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 100.60 ft
Outlet Station: 40.00 ft
Outlet Elevation: 100.00 ft
Number of Barrels: 2

Culvert Data Summary - 40' Roadway Crossing

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0140
Culvert Type: Straight
Inlet Configuration: 1:1 Bevel Headwall
Inlet Depression: None

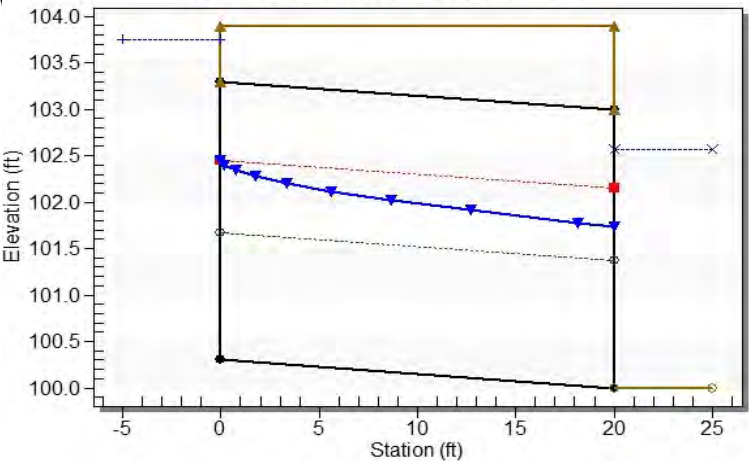
Paradise Valley Watershed Studies - Cheney Watershed

Preliminary Culvert Sizing

Milestone: Alternatives Analysis

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	100.30	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
50.00	50.00	101.61	1.308	1.303	1-S1t	0.525	0.814	1.333	1.333	3.125	4.018
100.00	100.00	102.33	2.029	1.691	1-JS1t	0.823	1.292	1.834	1.834	4.544	4.810
150.00	150.00	102.95	2.651	2.252	1-JS1t	1.078	1.693	2.197	2.197	5.688	5.337
200.00	200.00	103.56	3.259	2.822	5-S2n	1.310	2.051	1.649	2.493	10.110	5.743
215.00	215.00	103.75	3.445	3.000	5-S2n	1.377	2.152	1.739	2.572	10.301	5.850
300.00	250.25	104.20	3.902	3.654	5-S2n	1.529	2.381	1.943	2.969	10.731	6.365
350.00	260.70	104.34	4.043	3.947	5-S1f	1.573	2.447	3.000	3.170	7.242	6.619
400.00	269.71	104.47	4.168	4.200	4-FFF	1.611	2.503	3.000	3.355	7.492	6.846
450.00	277.97	104.59	4.285	4.441	4-FFF	1.645	2.554	3.000	3.525	7.721	7.052
500.00	285.55	104.69	4.394	4.668	4-FFF	1.677	2.600	3.000	3.685	7.932	7.242

Crossing - Cheney C3-1 - Typical Driveway Culvert, Design Discharge - 215.0 cfs
Culvert - 20' Driveway, Culvert Discharge - 215.0 cfs



Site Data - 20' Driveway

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 100.30 ft
Outlet Station: 20.00 ft
Outlet Elevation: 100.00 ft
Number of Barrels: 2

Culvert Data Summary - 20' Driveway

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0140
Culvert Type: Straight
Inlet Configuration: 1:1 Bevel Headwall
Inlet Depression: None

Table 2 - Culvert
Summary Table: 20'
Driveway

Straight Culvert
Inlet Elevation (invert): 100.30 ft,
Outlet Elevation (invert): 100.00 ft
Culvert Length: 20.00 ft, Culvert
Slope: 0.0150

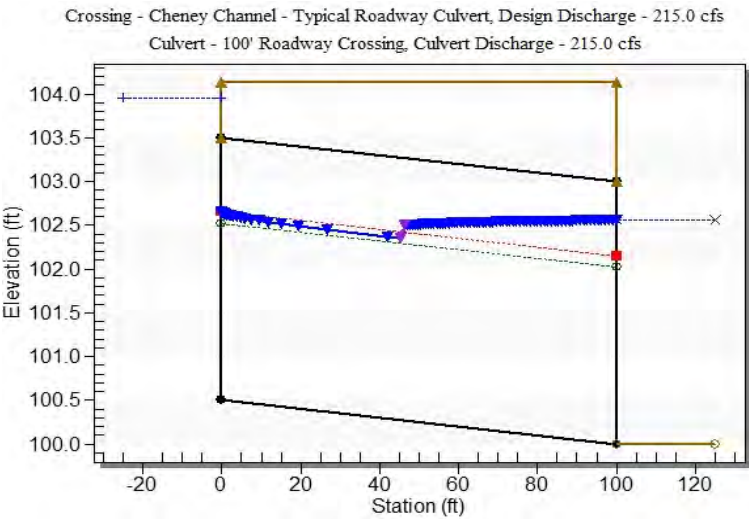
ALTERNATIVE CHENEY 3 - CHANNEL C3-2

Table 1 - Culvert Summary Table: 100' Roadway Crossing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	100.50	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
50.00	50.00	101.82	1.323	0.878	1-S2n	0.749	0.814	0.749	1.325	5.566	4.058
100.00	100.00	102.54	2.044	1.535	1-S2n	1.187	1.292	1.187	1.823	7.018	4.858
150.00	150.00	103.17	2.666	2.161	1-S2n	1.569	1.693	1.569	2.185	7.965	5.390
200.00	200.00	103.77	3.274	2.826	5-JS1t	1.923	2.051	2.478	2.478	6.725	5.800
215.00	215.00	103.96	3.460	3.037	5-JS1t	2.025	2.152	2.558	2.558	7.005	5.908
300.00	251.68	104.44	3.936	3.794	5-S2n	2.269	2.391	2.269	2.952	9.245	6.428
350.00	262.17	104.58	4.079	4.109	4-FFF	2.337	2.456	3.000	3.153	7.283	6.684
400.00	271.19	104.70	4.204	4.394	4-FFF	3.000	2.513	3.000	3.336	7.533	6.913
450.00	279.45	104.82	4.321	4.660	4-FFF	3.000	2.563	3.000	3.506	7.762	7.122
500.00	287.03	104.93	4.430	4.910	4-FFF	3.000	2.609	3.000	3.664	7.973	7.313

Straight Culvert
Inlet Elevation (invert): 100.50 ft,
Outlet Elevation (invert): 100.00 ft

Culvert Length: 100.00 ft,
Culvert Slope: 0.0050



Site Data - 100' Roadway Crossing

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 100.50 ft
Outlet Station: 100.00 ft
Outlet Elevation: 100.00 ft
Number of Barrels: 2

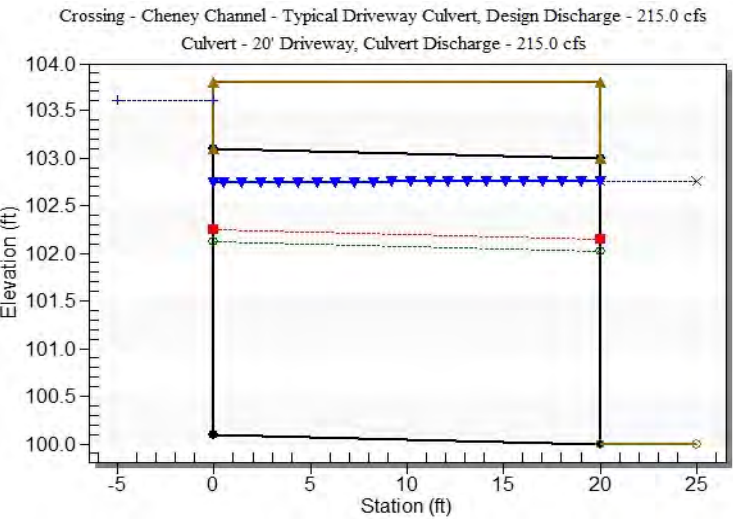
Culvert Data Summary - 100' Roadway Crossing

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0140
Culvert Type: Straight
Inlet Configuration: 1:1 Bevel Headwall
Inlet Depression: None

Table 2 - Culvert Summary Table: 20' Driveway

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	100.10	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
50.00	50.00	101.61	1.323	1.513	1-S1t	0.749	0.814	1.433	1.433	2.907	3.583
100.00	100.00	102.34	2.044	2.235	1-S1t	1.187	1.292	1.966	1.966	4.238	4.287
150.00	150.00	102.92	2.666	2.824	1-S1t	1.569	1.693	2.352	2.352	5.314	4.755
200.00	200.00	103.45	3.274	3.351	1-S1t	1.923	2.051	2.666	2.666	6.252	5.116
215.00	215.00	103.60	3.460	3.501	1-S1t	2.025	2.152	2.751	2.751	6.514	5.210
300.00	255.09	104.08	3.982	4.096	4-FFF	2.291	2.412	3.000	3.171	7.086	5.669
350.00	265.73	104.23	4.128	4.397	4-FFF	2.360	2.479	3.000	3.385	7.381	5.894
400.00	274.82	104.35	4.255	4.670	4-FFF	3.000	2.535	3.000	3.581	7.634	6.096
450.00	283.06	104.47	4.372	4.923	4-FFF	3.000	2.585	3.000	3.762	7.863	6.280
500.00	290.60	104.58	4.482	5.160	4-FFF	3.000	2.631	3.000	3.931	8.072	6.449

Straight Culvert
Inlet Elevation (invert): 100.10 ft,
Outlet Elevation (invert): 100.00 ft
Culvert Length: 20.00 ft, Culvert
Slope: 0.0050



Site Data - 20' Driveway

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 100.10 ft
Outlet Station: 20.00 ft
Outlet Elevation: 100.00 ft
Number of Barrels: 2

Culvert Data Summary - 20' Driveway

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0140
Culvert Type: Straight
Inlet Configuration: 1:1 Bevel Headwall
Inlet Depression: None

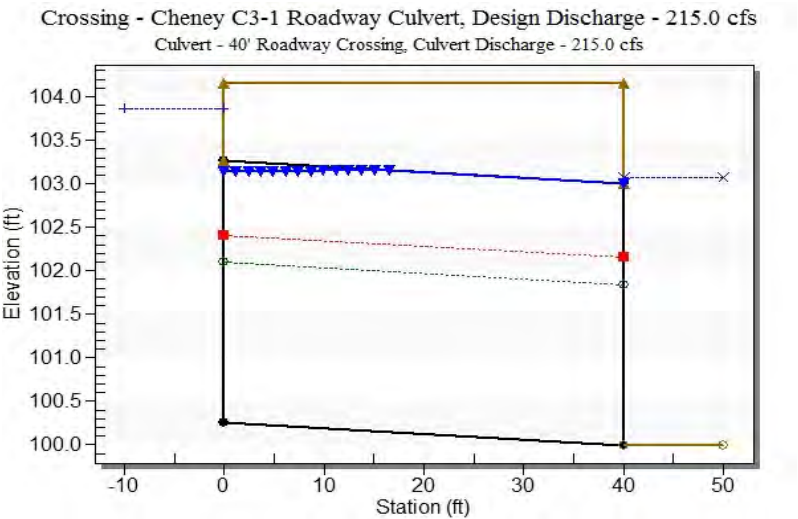
ALTERNATIVE CHENEY 3 - CHANNEL C3-3

Table 1 - Culvert Summary Table: 40' Roadway Crossing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	100.26	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
50.00	50.00	101.78	1.320	1.520	1-S1t	0.688	0.814	1.619	1.619	2.574	2.949
100.00	100.00	102.53	2.042	2.274	1-S1t	1.087	1.292	2.210	2.210	3.771	3.525
150.00	150.00	103.13	2.664	2.875	1-S1t	1.433	1.693	2.638	2.638	4.739	3.908
200.00	200.00	103.66	3.271	3.404	1-S1t	1.752	2.051	2.985	2.985	5.584	4.204
215.00	215.00	103.86	3.458	3.601	1-S1f	1.844	2.152	3.000	3.078	5.972	4.281
300.00	256.13	104.44	3.994	4.406	4-FFF	2.089	2.419	3.000	3.544	7.115	4.657
350.00	266.36	104.58	4.134	4.734	4-FFF	2.149	2.483	3.000	3.781	7.399	4.841
400.00	275.25	104.71	4.259	5.032	4-FFF	2.201	2.538	3.000	3.997	7.646	5.007
450.00	283.26	104.83	4.373	5.309	4-FFF	2.247	2.587	3.000	4.197	7.868	5.158
500.00	290.67	104.94	4.481	5.569	4-FFF	2.290	2.631	3.000	4.384	8.074	5.296

Straight Culvert
Inlet Elevation (invert): 100.26 ft,
Outlet Elevation (invert): 100.00 ft
Culvert Length: 40.00 ft, Culvert
Slope: 0.0065

Water Surface Profile Plot for Culvert: 40' Roadway Crossing



Site Data - 40' Roadway Crossing

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 100.26 ft
Outlet Station: 40.00 ft
Outlet Elevation: 100.00 ft
Number of Barrels: 2

Culvert Data Summary - 40' Roadway Crossing

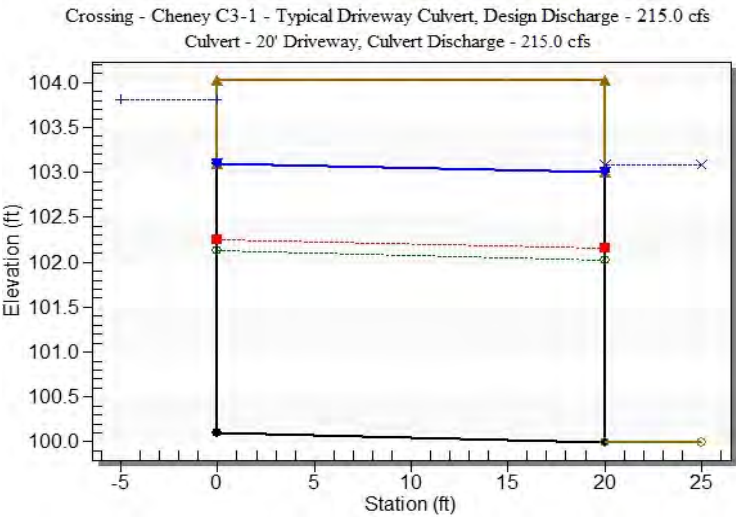
Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0140
Culvert Type: Straight
Inlet Configuration: 1:1 Bevel Headwall
Inlet Depression: None

Table 2 - Culvert Summary Table: 20' Driveway

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	100.10	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
50.00	50.00	101.76	1.323	1.657	1-S1t	0.749	0.814	1.619	1.619	2.574	2.949
100.00	100.00	102.50	2.044	2.399	1-S1t	1.187	1.292	2.210	2.210	3.771	3.525
150.00	150.00	103.09	2.666	2.989	1-S1t	1.569	1.693	2.638	2.638	4.739	3.908
200.00	200.00	103.61	3.274	3.507	1-S1t	1.923	2.051	2.985	2.985	5.584	4.204
215.00	215.00	103.81	3.460	3.706	4-FFF	2.025	2.152	3.000	3.078	5.972	4.281
300.00	253.82	104.32	3.965	4.458	4-FFF	2.283	2.404	3.000	3.544	7.051	4.657
350.00	264.48	104.46	4.110	4.782	4-FFF	2.352	2.471	3.000	3.781	7.347	4.841
400.00	273.65	104.59	4.238	5.076	4-FFF	3.000	2.528	3.000	3.997	7.601	5.007
450.00	282.03	104.70	4.358	5.349	4-FFF	3.000	2.579	3.000	4.197	7.834	5.158
500.00	289.77	104.81	4.470	5.605	4-FFF	3.000	2.626	3.000	4.384	8.049	5.296

Straight Culvert
Inlet Elevation (invert): 100.10 ft,
Outlet Elevation (invert): 100.00 ft
Culvert Length: 20.00 ft, Culvert
Slope: 0.0050

Water Surface Profile Plot for Culvert: 20' Driveway



Site Data - 20' Driveway

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 100.10 ft
Outlet Station: 20.00 ft
Outlet Elevation: 100.00 ft
Number of Barrels: 2

Culvert Data Summary - 20' Driveway

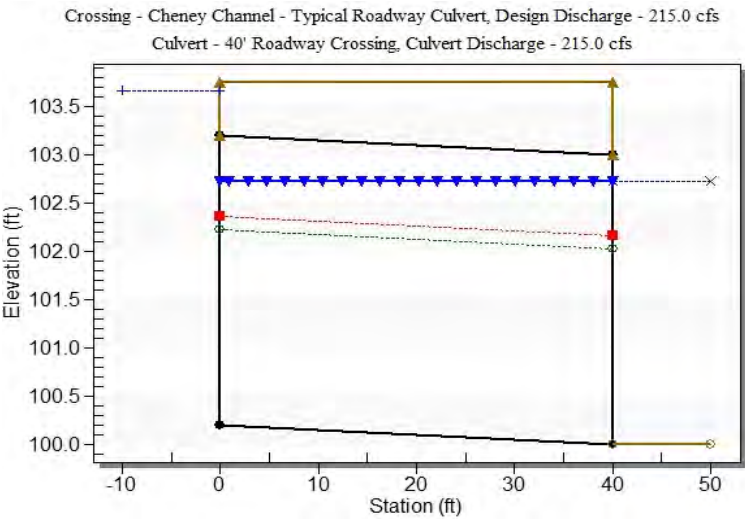
Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0140
Culvert Type: Straight
Inlet Configuration: 1:1 Bevel Headwall
Inlet Depression: None

ALTERNATIVE CHENEY 3 - CHANNEL C3-4

Table 1 - Culvert Summary Table: 40' Roadway Crossing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	100.20	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
50.00	50.00	101.63	1.323	1.430	1-S1t	0.749	0.814	1.419	1.419	2.937	3.642
100.00	100.00	102.36	2.044	2.165	1-S1t	1.187	1.292	1.947	1.947	4.280	4.358
150.00	150.00	102.97	2.666	2.767	1-S1t	1.569	1.693	2.330	2.330	5.365	4.833
200.00	200.00	103.51	3.274	3.307	1-S1t	1.923	2.051	2.641	2.641	6.311	5.200
215.00	215.00	103.66	3.460	3.461	1-S1t	2.025	2.152	2.725	2.725	6.576	5.297
300.00	246.55	104.07	3.868	3.982	4-FFF	2.235	2.358	3.000	3.142	6.849	5.763
350.00	256.91	104.21	4.007	4.283	4-FFF	2.303	2.424	3.000	3.354	7.136	5.992
400.00	265.95	104.33	4.131	4.558	4-FFF	2.362	2.480	3.000	3.548	7.388	6.197
450.00	274.20	104.45	4.246	4.813	4-FFF	3.000	2.531	3.000	3.728	7.617	6.384
500.00	281.78	104.55	4.354	5.053	4-FFF	3.000	2.577	3.000	3.895	7.827	6.555

Straight Culvert
Inlet Elevation (invert): 100.20 ft,
Outlet Elevation (invert): 100.00 ft
Culvert Length: 40.00 ft, Culvert
Slope: 0.0050



Site Data - 40' Roadway Crossing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 100.20 ft

Outlet Station: 40.00 ft

Outlet Elevation: 100.00 ft

Number of Barrels: 2

Culvert Data Summary - 40' Roadway Crossing

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0140

Culvert Type: Straight

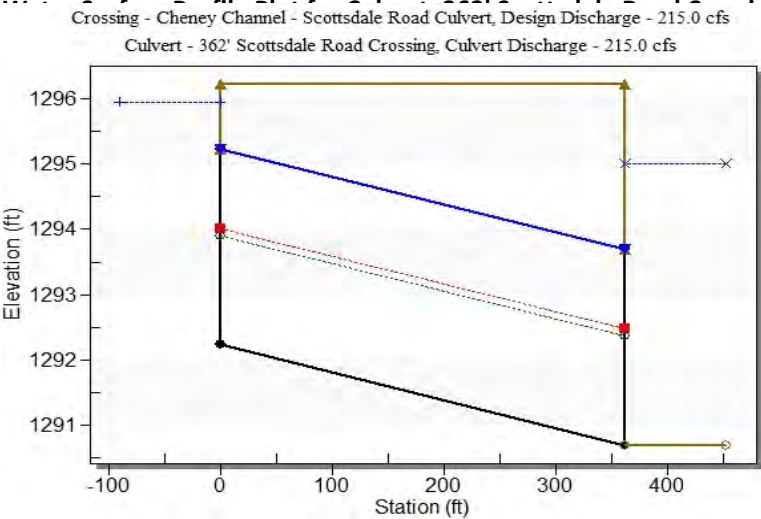
Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: None

Table 2 - Culvert Summary Table: 362' Scottsdale Road Crossing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	1295.00	0.000	2.770	0-NF	0.000	0.000	3.000	4.300	0.000	0.000
50.00	50.00	1295.05	1.093	2.820	1-S1f	0.643	0.672	3.000	4.300	1.042	0.000
100.00	100.00	1295.20	1.710	2.972	1-S1f	1.005	1.067	3.000	4.300	2.083	0.000
150.00	150.00	1295.46	2.205	3.230	4-FFF	1.314	1.398	3.000	4.300	3.125	0.000
200.00	200.00	1295.82	2.667	3.587	4-FFF	1.594	1.693	3.000	4.300	4.167	0.000
215.00	215.00	1295.94	2.803	3.715	4-FFF	1.675	1.777	3.000	4.300	4.479	0.000
300.00	267.20	1296.46	3.280	4.229	4-FFF	1.944	2.054	3.000	4.300	5.567	0.000
350.00	280.31	1296.61	3.402	4.376	4-FFF	2.010	2.120	3.000	4.300	5.840	0.000
400.00	291.29	1296.73	3.505	4.504	4-FFF	2.065	2.175	3.000	4.300	6.069	0.000
450.00	300.99	1296.85	3.598	4.621	4-FFF	2.112	2.223	3.000	4.300	6.271	0.000
500.00	309.86	1296.96	3.683	4.732	4-FFF	2.156	2.267	3.000	4.300	6.455	0.000

Straight Culvert
Inlet Elevation (invert): 1292.23 ft,
Outlet Elevation (invert): 1290.70 ft
Culvert Length: 362.00 ft,
Culvert Slope: 0.0042



Site Data - 362' Scottsdale Road Crossing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 1292.23 ft

Outlet Station: 362.00 ft

Outlet Elevation: 1290.70 ft

Number of Barrels: 2

Culvert Data Summary - 362' Scottsdale Road Crossing

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0140

Culvert Type: Straight

Inlet Configuration: 1:1 Bevel Headwall

Inlet Depression: None

Paradise Valley Watershed Studies - Cheney Watershed

Preliminary Scour Estimation

Milestone: Alternatives Analysis

ADWR State Standard SSA 5-96 Level 1

$$d_s = d_{gs} + d_{lts}$$

$$d_s = \text{Total Scour (ft) (*min = 3.0 ft)}$$
$$d_{gs} = \text{General Scour (ft)}$$
$$d_{lts} = \text{Long Term Scour (ft)}$$

$$d_{gs} = 0.157(Q_{100})^{0.4} \quad \text{for straight channel reaches.}$$

$$d_{gs} = 0.219(Q_{100})^{0.4} \quad \text{for channel reaches with curvature.}$$

Long term degradation can be computed as follows:

$$d_{lts} = 0.02(Q_{100})^{0.6}$$

[illegible]

Paradise Valley Watershed Studies - Cheney Watershed
Preliminary Bank Protection Sizing and Cost Estimation
Milestone: Alternatives Analysis

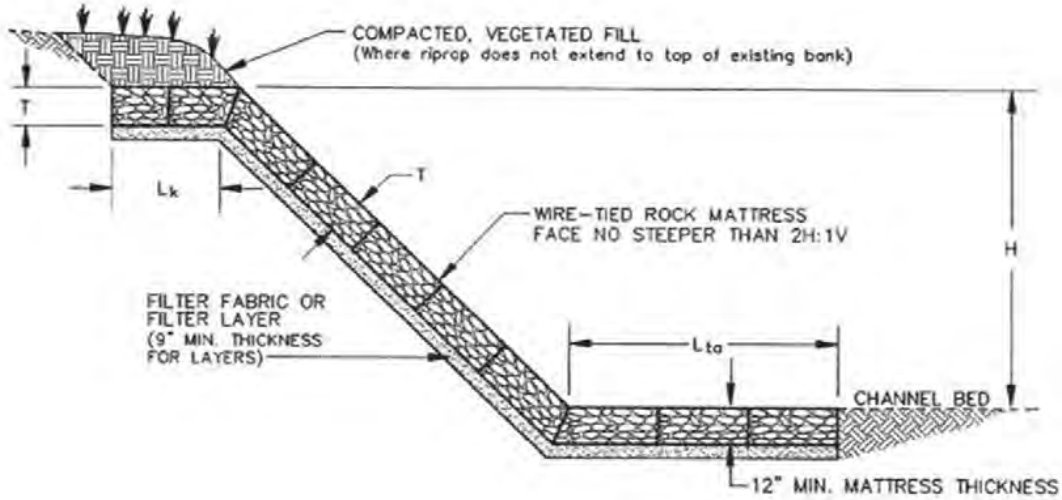
PRELIMINARY BANK PROTECTION DESIGN AND COSTS																																								
Location			Channel Geometry						Design Parameters									Wire-Tied Rock Quantities							Excavation					Land Acquisition					Cost					
Alternative	Bank	Element ID	Channel Length (ft)	100-Yr Depth (ft)	Pro Height (ft)	Side Slope (H:1V)	Curved	Pro Length (ft)	Q ₁₀₀ (cfs)	Velocity (ft/s)	Req Freeboard (ft)	Y (ft)	H (ft)	W (ft)	T (ft)	L _k (ft)	L _{ta} (ft)	Key-in Area (sf)	Bank Area (sf)	Toe Area (sf)	Total Area (sf)	Ave Area (sf)	Total Vol (cy)	Unit Cost (\$/CY)	Wire-Tied Rock Cost	Ave Area (sf)	Total Vol (cf)	Total Volume (cy)	Unit Cost (\$/CY)	Excavation Cost	Required Land Acquisition (sf.)	Zoning	Unit Cost (\$/sf)	Land Acquisition Cost	Total Construction Cost	Total Contingencies Cost	Total Construction and Contingency	Total Construction, Contingencies, and Land Costs		
		EC1-1		3.1	5.6	2	Y	12.6	603	10.59	2.5	3.1	5.6	28.2	1.5	3.0	8.4	4.5	18.9	12.7	36.1																			
EC1-1	Right		975.0																			36.1	1303	\$180	\$234,476	36	35171	1303	6	\$7,816	22151	RES	\$26.00	\$575,919	\$242,292	\$278,636	\$520,928	\$1,096,846		
		EC1-1		3.1	5.6	2	Y	12.6	603	10.59	2.5	3.1	5.6	28.2	1.5	3.0	8.4	4.5	18.9	12.7	36.1																			

Notes:

1. Quantities and opinions of probable cost are for planning purposes only and are not intended for construction.
2. Quantities are based on Level 1 procedures per ADWR State Standard guidelines (SSA 5-96 and SSA 7-98).
3. Level 1 procedures was developed for use where the design discharge is less than or equal to 3,000 cfs
4. Left or right bank is designated looking down station.
5. Protection Length is the slope length above the channel invert that must be stabilized and is based on the protection depth plus freeboard.
6. Required freeboard was calculated per the Standards Manual, using flow depths and velocities at each cross section.
7. Y is the maximum 100-year flood depth when run at subcritical flow plus freeboard
8. H is the required height of bank protection
9. W is the width of bank stabilization cut-off (W = 5H) (Most installations will tie to a rigid structure, so this is not used in Cost Est.)
10. T is the wire-tied rock mattress thickness per the following table.

SS 7-98 Table 5			
Straight Reach Q (cfs)	Min Thickness, T (ft)	Curved Reach Q (cfs)	Min Thickness, T (ft)
0	0.75	0	0.75
1249	0.75	299	0.75
1250	1	300	1
2499	1	599	1
2500	1.5	600	1.5
6999	1.5	1799	1.5
7000	3	1800	3
40000	3	10000	3

11. Lk is the length of the top-of-bank key-in
Lk is the max of: 5(Y-H) or 2T
12. Lta is the length of the toe apron (Lta = 2.24ds)



Paradise Valley Watershed Studies - Cheney Watershed
Preliminary Storage Basin Sizing and Cost Estimation
Milestone: Alternatives Analysis

Preliminary Storage Basin Design & Cost																																			
Alternative Name	Alternative Element ID	Basin Excavation Volume (cy)	Unit Cost (\$/cy)	Detention Basin Excavation Cost	Length of Outlet Pipe (ft.)	Outlet Pipe Size	Unit Cost (\$/ft.)	Length of Outfall Pipe (ft.)	Outfall Pipe Size	Unit Cost (\$/ft.)	Total Outlet system Cost	# Of Manholes	Manhole Unit Cost	Manhole Total Cost	No. of Headwalls	Unit Cost (Ea.)	Headwall Cost	Basin Top Area (ac)	Required Land Acquisition (Ac.)	Zoning	Land Unit Cost (\$/sf)	Total Land Acquisition Cost	Landscape Area (sf)	Designed Landscape Unit Cost (\$/sf)	Total Designed Landscape Cost	Underground Retention Volume (ac-ft)	Length of 96" Underground Retention Required (ft)	Underground Retention Unit Cost (\$/ft)	Underground Retention Surface Treatment Area (sf)	Underground Retention Surface Treatment Unit Cost (\$/sf)	Underground Retention Cost	Total Construction Cost	Contingency Cost	Total Construction & Contingency	Total Construction, Land, and Landscape Costs
Cheney 1 Cheney 2 Cheney 3	B1-1	964	\$6	\$5,785	0	24	\$104	0	24	\$104	\$0	0	\$7,500	\$0	0	\$5,500	\$0	0.138	0.172	Res	\$26	\$195,000	6,000	\$2.00	\$12,000	0	0				\$0	\$17,784.53	\$5,335	\$23,120	\$218,120
	B1-1	964	\$6	\$5,785	0	24	\$104	0	24	\$104	\$0	0	\$7,500	\$0	0	\$5,500	\$0	0.138	0.172	Res	\$26	\$195,000	6,000	\$2.00	\$12,000	0	0				\$0	\$17,784.53	\$5,335	\$23,120	\$218,120
	B1-1	964	\$6	\$5,785	0	24	\$104	0	24	\$104	\$0	0	\$7,500	\$0	0	\$5,500	\$0	0.138	0.172	Res	\$26	\$195,000	6,000	\$2.00	\$12,000	0	0				\$0	\$17,784.53	\$5,335	\$23,120	\$218,120
Mockingbird 1 Mockingbird 1	B1-1	695	\$6	\$4,169	0	24	\$104	0	24	\$104	\$0	0	\$7,500	\$0	0	\$5,500	\$0	0.069	0.086	Res	\$26	\$97,500	3,000	\$2.00	\$6,000	0	0				\$0	\$10,169.24	\$3,051	\$13,220	\$110,720
	B1-2	4,074	\$6	\$24,444	350	24	\$104	0	24	\$104	\$36,400	1	\$7,500	\$7,500	2	\$5,500	\$11,000	1.359	2.806	Res	\$26	\$3,178,136	59,200	\$2.00	\$118,400	2.76	2395	\$200.00	48236.00	\$4.00	\$671,930	\$869,675	\$260,902	\$1,130,577	\$4,308,713
Mockingbird 2 Mockingbird 2	B1-1	695	\$6	\$4,169	0	24	\$104	0	24	\$104	\$0	0	\$7,500	\$0	0	\$5,500	\$0	0.069	0.086	Res	\$26	\$97,500	3,000	\$2.00	\$6,000	0	0				\$0	\$10,169	\$3,051	\$13,220	\$110,720
	B1-2	4,074	\$6	\$24,444	350	24	\$104	0	24	\$104	\$36,400	1	\$7,500	\$7,500	2	\$5,500	\$11,000	1.359	3.152	Res	\$26	\$3,569,904	59,200	\$2.00	\$118,400	3.80	3297	\$200.00	63304.00	\$4.00	\$912,690	\$1,110,435	\$333,130	\$1,443,565	\$5,013,469
Mockingbird 3 Maverick 2	B1-1	695	\$6	\$4,169	0	24	\$104	0	24	\$104	\$0	0	\$7,500	\$0	0	\$5,500	\$0	0.069	0.086	Res	\$26	\$97,500	3,000	\$2.00	\$6,000	0	0				\$0	\$10,169	\$3,051	\$13,220	\$110,720
	B1-1	4,337	\$6	\$26,025	0	24	\$104	0	24	\$104	\$0	0	\$7,500	\$0	0	\$5,500	\$0	0.230	0.287	Res	\$26	\$325,000	10,000	\$2.00	\$20,000	0	0				\$0	\$46,025	\$13,807	\$59,832	\$384,832

Appendix G: Alternatives Cost Summary

Paradise Valley Watershed Studies - Cheney Watershed

Preliminary Cost Estimate
Milestone: Alternatives Analysis

Alternative Cheney 1						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	1291 LF of 48" Ø Storm Drain	\$143,000	\$312,000	\$631,498	\$36,058.56	\$1,122,557
P1-2	187 LF of 24" Ø Storm Drain	\$0	\$0	\$90,464	\$5,166	\$95,630
P1-3	1310 LF of 48" Ø Storm Drain	\$250,900	\$0	\$634,842	\$36,249	\$921,991
P2-1	* 1366 LF of 2-60" Ø Storm Drain	\$0	\$0	\$0	\$0	\$0
P3-1	435 LF of 30" Ø Storm Drain	\$44,200	\$0	\$203,743	\$11,634	\$259,576
P4-1	759 LF of 30" Ø Storm Drain	\$35,100	\$291,200	\$334,767	\$19,115	\$680,182
P4-2	1246 LF of 30" Ø Storm Drain	\$75,400	\$0	\$520,263	\$29,707	\$625,370
B1-1	Sediment Basin	\$18,200	\$195,000	\$23,120	\$1,320	\$237,640
* Element represents a FCDMC planned element					Construction Cost	\$2,577,946
					Land Acquisition Cost	\$798,200
					Utiliy Relocation Cost	\$566,800
					Total Cost	\$3,942,946

Alternative Cheney 2						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	1291 LF of 66" Ø Storm Drain	\$143,000	\$312,000	\$747,656	\$42,691	\$1,245,347
P1-2	187 LF of 24" Ø Storm Drain	\$0	\$0	\$90,464	\$5,166	\$95,630
P1-3	1310 LF of 66" Ø Storm Drain	\$250,900	\$0	\$757,458	\$43,251	\$1,051,609
P1-4	* 1324 LF of 2-72" Ø Storm Drain	\$0	\$0	\$206,544	\$11,794	\$218,338
P1-5	* 1909 LF of 2-72" Ø Storm Drain	\$0	\$0	\$297,804	\$17,005	\$314,809
P2-1	435 LF of 30" Ø Storm Drain	\$44,200	\$0	\$203,743	\$11,634	\$259,576
P3-1	759 LF of 30" Ø Storm Drain	\$35,100	\$291,200	\$334,767	\$19,115	\$680,182
P3-2	1246 LF of 30" Ø Storm Drain	\$75,400	\$0	\$520,263	\$29,707	\$625,370
B1-1	Sediment Basin	\$18,200	\$195,000	\$23,120	\$1,320	\$237,640
* Element represents an upsizing of a FCDMC planned element					Construction Cost	\$3,363,500
					Land Acquisition Cost	\$798,200
					Utiliy Relocation Cost	\$566,800
					Total Cost	\$4,728,500

Alternative Cheney 3						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	* 1366 LF of 2-60" Ø Storm Drain	\$0	\$0	\$0	\$0	\$0
P2-1	435 LF of 30" Ø Storm Drain	\$44,200	\$0	\$203,743	\$11,634	\$259,576
P3-1	759 LF of 30" Ø Storm Drain	\$35,100	\$291,200	\$334,767	\$19,115	\$680,182
P3-2	1246 LF of 30" Ø Storm Drain	\$75,400	\$0	\$520,263	\$29,707	\$625,370
C1-1	1513 LF Channel See Figures 6 & 7	\$178,103	\$0	\$792,602	\$45,258	\$1,015,962
C1-2	1324 LF Channel See Figures 6 & 7	\$196,300	\$240,968	\$606,387	\$34,625	\$1,078,279
C1-3	1326 LF Channel See Figures 6 & 7	\$150,800	\$379,236	\$574,446	\$32,801	\$1,137,283
C1-4	1209 LF Channel See Figures 6 & 7	\$301,600	\$408,642	\$766,354	\$43,759	\$1,520,355
B1-1	Sediment Basin	\$18,200	\$195,000	\$23,120	\$1,320	\$237,640
* Element represents a FCDMC planned element					Construction Cost	\$4,039,899
					Land Acquisition Cost	\$1,515,046
					Utiliy Relocation Cost	\$999,703
					Total Cost	\$6,554,647

Paradise Valley Watershed Studies - Cheney Watershed

Preliminary Cost Estimate
Milestone: Alternatives Analysis

Alternative Mockingbird 1						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	395 LF of 48" Ø Storm Drain	\$158,600	\$0	\$218,712	\$12,488.46	\$389,800
B1-1	Sediment Basin	\$6,500	\$97,500	\$13,220	\$755	\$117,975
B1-2	2.806 Ac-ft Retention Basin	\$0	\$3,178,136	\$1,130,577	\$53,250.19	\$4,361,964
					Construction Cost	\$1,429,003
					Land Acquisition Cost	\$3,275,636
					Utiliy Relocation Cost	\$165,100
					Total Cost	\$4,869,739

Alternative Mockingbird 2						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	395 LF of 54" Ø Storm Drain	\$158,600	\$0	\$230,009	\$13,133.51	\$401,743
B1-1	Sediment Basin	\$6,500	\$97,500	\$13,220	\$755	\$117,975
B1-2	3.152 Ac-ft Retention Basin	\$0	\$3,569,904	\$1,443,565	\$67,991.91	\$5,081,461
					Construction Cost	\$1,768,674
					Land Acquisition Cost	\$3,667,404
					Utiliy Relocation Cost	\$165,100
					Total Cost	\$5,601,178

Alternative Mockingbird 3						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	1405 LF of 42" Ø Storm Drain	\$54,600	\$696,800	\$629,135	\$29,632.26	\$1,410,167
C1-1	** Channel Reconstruction	\$0	\$0	\$0	\$0	\$0
B1-1	Sediment Basin	\$0	\$97,500	\$13,220	\$755	\$111,475
** Cost of channel reconstruction is considered incidental to storm drain construction					Construction Cost	\$672,742
					Land Acquisition Cost	\$794,300
					Utiliy Relocation Cost	\$54,600
					Total Cost	\$1,521,642



Paradise Valley Watershed Studies - Cheney Watershed

Preliminary Cost Estimate
Milestone: Alternatives Analysis

Alternative Quartz Mountain 1						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	1207 LF of 24" Ø Storm Drain	\$241,150	\$0	\$593,980	\$33,916.28	\$869,047
P1-2	651 LF of 30" Ø Storm Drain	\$32,500	\$140,400	\$297,358	\$16,979	\$487,237
C1-1	1207 LF Sediment Ditch See Figure 11	\$156,000	\$156,910	\$219,365	\$12,526	\$544,801
EC1-1	975 LF Bank Protection	\$0	\$575,919	\$520,928	\$29,745	\$1,126,591
Construction Cost						\$1,724,797
Land Acquisition Cost						\$873,229
Utiliy Relocation Cost						\$429,650
Total Cost						\$3,027,676

Alternative Quartz Mountain 2						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	1207 LF of 30" Ø Storm Drain	\$241,150	\$0	\$638,494	\$36,457.99	\$916,102
P1-2	651 LF of 36" Ø Storm Drain	\$32,500	\$140,400	\$305,708	\$17,456	\$496,064
C1-1	1207 LF Sediment Ditch See Figure 11	\$156,000	\$156,910	\$219,365	\$12,526	\$544,801
EC1-1	975 LF Bank Protection	\$0	\$575,919	\$520,928	\$29,745	\$1,126,591
Construction Cost						\$1,780,679
Land Acquisition Cost						\$873,229
Utiliy Relocation Cost						\$429,650
Total Cost						\$3,083,557

Alternative Quartz Mountain 3						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	1207 LF of 30" Ø Storm Drain	\$241,150	\$0	\$651,130	\$37,179.51	\$929,459
P1-2	651 LF of 42" Ø Storm Drain	\$32,500	\$140,400	\$318,383	\$18,180	\$509,463
C1-1	1207 LF Sediment Ditch See Figure 11	\$156,000	\$156,910	\$219,365	\$12,526	\$544,801
EC1-1	975 LF Bank Protection	\$0	\$575,919	\$520,928	\$29,745	\$1,126,591
Construction Cost						\$1,807,435
Land Acquisition Cost						\$873,229
Utiliy Relocation Cost						\$429,650
Total Cost						\$3,110,314

Paradise Valley Watershed Studies - Cheney Watershed

Preliminary Cost Estimate
Milestone: Alternatives Analysis

Alternative Maverick 1						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	1183 LF of 54" Ø Storm Drain	\$322,400	\$615,160	\$618,397	\$29,126.50	\$1,585,083
P1-2	777 LF of 2-48" Ø Storm Drain	\$13,000	\$372,840	\$606,336	\$28,558.41	\$1,020,734
C1-1	** Channel Reconstruction	\$0	\$0	\$0	\$0	\$0
C1-2	** Channel Reconstruction	\$0	\$0	\$0	\$0	\$0
** Cost of channel reconstruction is considered incidental to storm drain construction					Construction Cost	\$1,282,418
					Land Acquisition Cost	\$988,000
					Utiliy Relocation Cost	\$335,400
					Total Cost	\$2,605,818

Alternative Maverick 2						
Element ID	Description	Potential Utility Relocation Cost (30% Contingency)	Land Aquisition Cost	Costruction Cost (30% Contingency)	Mobilization, Miscellaneous Removals, & Traffic Control	Element Cost
P1-1	* 411 LF of 2-48" Ø Storm Drain	\$0	\$0	\$111,134	\$6,345.77	\$117,480
P1-2	* 1057 LF of 2-54" Ø Storm Drain	\$0	\$0	\$316,043	\$18,046	\$334,089
P1-3	* 1183 LF of 66" Ø Storm Drain	\$0	\$0	\$0	\$0	\$0
P1-4	* 1466 LF of 72" Ø Storm Drain	\$0	\$0	\$0	\$0	\$0
P1-5	1183 LF of 54" Ø Storm Drain	\$322,400	\$615,160	\$618,397	\$29,126.50	\$1,585,083
P1-6	777 LF of 2-48" Ø Storm Drain	\$13,000	\$372,840	\$606,336	\$28,558.41	\$1,020,734
C1-1	** Channel Reconstruction	\$0	\$0	\$0	\$0	\$0
C1-2	** Channel Reconstruction	\$0	\$0	\$0	\$0	\$0
B1-1	Sediment Basin	\$5,500	\$325,000	\$59,832	\$2,818.08	\$393,150
* Element represents a FCDMC planned element or using of a FCDMC planned element					Construction Cost	\$1,796,637
** Cost of channel reconstruction is considered incidental to storm drain construction					Land Acquisition Cost	\$1,313,000
					Utiliy Relocation Cost	\$340,900
					Total Cost	\$3,450,537

Appendix H: Evaluation Matrices

Town of Paradise Valley Watershed Studies - Cheney Watershed Preferred Alternatives Selection Matrix

Scoring Completed by:

[illegible]

Town of Paradise Valley Watershed Studies - Cheney Watershed Preferred Alternatives Prioritization Matrix

Scoring Completed by:			Preferred Alternatives			
	Cat Wt	Weight	Cheney X	Mockingbird X	Quartz Mountain X	Maverick X
Stormwater Management Effectiveness	35	100	0	0	0	0
	Increase in public safety	30				
	Level of flood protection provided	20				
	Breadth of flood protection provided in hazard area	20				
	Use of LID opportunities	15				
	Passive vs. active intervention systems	15				
Cost	25	100	0	0	0	0
	Initial cost	40				
	Cost sharing / grant / outside funding	30				
	Maintains, replaces or expands an existing asset	15				
	Life-cycle cost	15				
Public Acceptance	20	100	0	0	0	0
	Conformance with public meeting polling	40				
	Maintains or improves aesthetic value	30				
	Avoids Disruption to the public	20				
	Multiuse opportunities	10				
Constructability/Construction Phasing	20	100	0	0	0	0
	Independence from FCDMC prioritization schedule	30				
	Allows for phasing with immediate benefit of initial phases	30				
	Ease of Construction	25				
	Permitting	15				

Town of Paradise Valley Watershed Studies - Cheney Watershed Preferred Alternatives Selection Matrix

Scoring Completed by: Dibble Engineering

Scoring Completed by: Dibble Engineering			Alternatives												
	Cat Wt	Weight	Cheney 1	Cheney 2	Cheney 3	Mockingbird 1	Mockingbird 2	Mockingbird 3	Quartz Mountain 1	Quartz Mountain 2	Quartz Mountain 3	Maverick 1	Maverick 2		
Stormwater Management Effectiveness			35	100	154	234.5	231	245	259	147	162.75	232.75	267.75	162.75	206.5
		30	3	6	6	7	7	2	4	8	10	4	4		
		20	4	8	7	6	8	6	4	8	10	5	7		
		20	3	6	8	5	5	3	5	5	5	4	6		
		15	4	4	2	8	8	2	1	1	1	1	4		
		15	10	10	10	10	10	10	10	10	10	10	10		
Cost			25	100	110	88.75	58.75	76.25	62.5	158.75	88.75	85	81.25	108.75	81.25
		40	5	4	1	2	1	8	1	1	1	3	1		
		30	5	5	5	5	5	5	5	5	5	5	5		
		15	1	1	1	1	1	5	5	5	5	5	5		
		15	5	2	2	4	3	6	6	5	4	6	4		
Public Acceptance			20	100	110	134	88	174	170	134	130	116	102	134	126
		40	4	8	6	10	10	8	8	8	8	8	8	8	
		30	8	8	4	9	9	6	6	5	4	6	6		
		20	7	5	1	6	5	8	7	5	3	8	6		
		10	1	1	6	8	8	1	1	1	1	1	1		
Constructability/Construction Phasing			20	100	164	94	116	112	104	122	111	106	101	122	59
		30	10	3	10	10	10	10	10	10	10	10	10	3	
		30	8	6	4	1	1	1	1	1	1	1	1	1	
		25	7	5	4	5	4	7	6	5	4	7	4		
		15	7	5	4	7	6	7	5	5	5	7	5		
Total			100		53.8	55.1	49.4	60.7	59.6	56.2	49.3	54.0	55.2	52.8	47.3

Improvement Area 1: Cheney
Improvement Area 2: Mockingbird
Improvement Area 3: Quartz Mountain
Improvement Area 4: Maverick

