



To	Mr. Brad Tong, Consulting Project Manager Shiels Oblatz Johnsen, Inc.	File No. 591M153760
From	Kristie Dunkin, Ph.D., PMP Project Manager Erik Christensen, Biologist Melinda Gray, Biologist	Cc: Theresa Wagner Seattle City Attorney's Office
Subject	Drainage routes from the Joint Training Facility, Seattle, Washington	
Date	February 7, 2007	

Summary

In summary, AMEC staff were able to determine the following flow paths for drainage from the Joint Training Facility (JTF) site (Figures 1 and 2).

North Drainage The flow path of the North Drainage was confirmed to flow starting from the JTF, east under Myers Way S, downhill, and into a culvert located at Old Myers Way. The drainage pathway and ultimate outfall for water entering this culvert at Old Myers Way was not determined, but water appears to flow into the storm drain system associated with State Highway 509 (SR 509).

South Drainage The South Drainage was confirmed to flow from the JTF site, east under Myers Way S, downhill into a vertical culvert, and beneath Old Myers Way and SR 509 to 4th Avenue S and S Barton Street, entering the City of Seattle storm drain system and flowing into the Duwamish River at 7th Avenue S.

Introduction

The City of Seattle Fleets and Facilities Department (FFD) retained the services of AMEC Earth & Environmental (AMEC) to verify the pathway of water draining from the City of Seattle's Joint Training Facility (JTF). The JTF is located at 9401 Myers Way S in Seattle, Washington.

The JTF was constructed beginning in 2004. Prior to that time, drainage from the area was repeatedly altered during a century of sand and gravel extraction, and during the development of local arterial roadways (Myers Way S) and State Highway 509 (SR 509). The sand and gravel operation ceased about 1996. This past use has resulted repeated alterations in the drainage configuration and in a variety of conflicting interpretations for the fate of drainage leaving the JTF site.

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Methods

Several sources of information were evaluated to gain an understanding of the drainage system.

These included:

- Seattle Public Utilities (SPU) Geographic Information System (GIS) map layers showing storm, sewer, and combined drainage systems (obtained on January 22, 2007).
- Fleets and Facilities Department construction documentation for the JTF.
- SR 509 drainage design plans supplied by SPU (obtained on January 26, 2007).
- Information from Ms. Masako Lo, P.E., SPU Design Engineer, who has worked on a variety of drainage projects and issues in the area since 1990.

In addition to reviewing these sources, AMEC staff conducted field verification surveys on January 17, 18, and 29, 2007 to locate and trace the flow of water through culverts and outfalls as the water travels from the JTF site to the Duwamish River.

Table 1 (attached) summarizes sources of information and method of confirmation for the drainage pathways.

To verify the flow path of water from the JTF site, AMEC staff first conducted a reconnaissance survey to investigate the location of storm drains and outfalls at the JTF site and eastward, across Myers Way S, down the forested topographic break toward SR 509, across SR 509, ending in the general vicinity of 4th Avenue S and S Barton Street. Outfall locations were recorded by GPS and later downloaded to GIS.

Once the storm drains, catch basins, and outfalls were identified, AMEC staff broke into two teams, with one team dropping labeled biodegradable tracing sticks (approximately 2.0 inches by 0.25 inches in size) into the drainage, while the second team watched for tracing sticks to appear at the suspected outfall. The appearance of a tracing stick at an outfall from a verified source provided confirmation of the direction of flow. This simple method is limited, because if no tracing sticks appear at a selected outfall, alternative unobserved outfalls and other potential routes cannot be eliminated.

Results

Two drainage flow paths were identified (see Figures 1 and 2). We have simplified the following discussion by calling these the North Drainage and the South Drainage. The North Drainage is defined as the water draining from the approximately the northern one-half of the JTF site, while the South Drainage drains approximately the southern one-half and areas lying immediately to the south of the JTF site.

Numbers given in the following text correspond to points and segments noted on Figures 1 and 2 and in Table 1.

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North Drainage

Along the western vicinity boundary of the JTF site, groundwater is expressed at the toe of a long slope (1). The water accumulates at the ground surface, flows through a short culvert (2, 3) and a watercourse forms in the vicinity of Area of Concern 8 (AOC 8) flowing due northeast (4). At the most northeastern extent of the JTF, the water drains into a culvert (5) and resurfaces (6), flowing at the surface through AOC 4 (7) on the JTF site. Surface water accumulates in AOC 3 adjacent to Myers Way S and drains north, to the northeastern most extent of the facility, where flows from AOC 4 and AOC 3 combine.

Water drains from the JTF site at the northeastern most extent of AOC 4 (northern most of AOC 3) at a culvert beneath Myers Way S (8). The water flows beneath Myers Way S to an outfall located several hundred feet to the east (9) where drainage resurfaces. Tracing sticks confirmed this flow path.

From the outfall east of Myers Way S, water drains on the surface approximately east (10) and downhill to "Old Myers Way" --a former location of Myers Way S and currently a single-track dirt road. At the old roadbed, the surface drainage turns roughly 90 degrees to the north and flows parallel along the old roadbed for approximately 250 feet. Drainage then enters a culvert beneath the old roadbed draining eastward (11).

At the point where water drained into the culvert beneath Old Myers Way, no further surface flows could be located in this vicinity. Downhill from this location lies SR 509. No surface flow was observed between Old Myers Way and SR 509. Thus, it was assumed that the likely location for an outfall for this flow, if any, would be located on the eastside of SR 509 and possibly at the 4th Avenue S and S Barton Street (Turkey Duck Pond) location (22 on Figure 2). The only suspected outfall located on the eastside of SR 509 was at Turkey Duck Pond. Approximately 30 labeled tracing sticks were placed in the flowing inlet at Old Myers Way; however, none of these were recovered at the Turkey Duck Pond outlet.

A stormwater catch basin was located immediately downhill from the culvert at Old Myers Way and lying adjacent to SR 509 (11A). Labeled tracing sticks placed in the water in this catch basin were also not recovered at the Turkey Duck Pond location.

Tracing sticks added to the culvert at Old Myers Way and to the catch basin at SR 509 were not observed at the Turkey Duck Pond outlet. No other outfalls on the east side of SR 509 were identified. It is assumed that the culvert at Old Myers Way drains to the stormwater system for SR 509 because no further surface drainage was found and the water appears to remain within a piped subsurface system. The flow path of drainage pipes associated with SR 509 is undetermined at this time.

South Drainage

Surface water from areas adjacent to the south of the JTF site (12 and 14), as well as catch basins (13), on-site piped subsurface drainage (15), and overflow water from the

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on-site stormwater facility (16) all drain to single large manhole (17) located adjacent to AOC 3 on the JTF.

This piped system has a vertical standpipe (18) located in AOC 3 that is not covered. Approximately 30 tracing sticks placed in this standpipe were recovered at an outfall east of Myers Way S (19) verifying the flow of water through this pipe.

From the outfall east of Myers Way S, surface water (20) drains east and downhill to a series of settling weirs and into a vertical inlet (21) covered by a large beehive trash rack adjacent to Old Myers Way. No surface flows were located to the east of this inlet between Old Myers Way and SR 509.

Approximately 30 labeled tracing sticks were placed in the water at the vertical inlet at Old Myers Way (21) and were recovered on the east side of SR 509 at the culvert (22 on Figure 2) that outlets into the western extent of the Turkey Duck Pond location at 4th Avenue S and S Barton Street.

Water flows at the surface through the Turkey Duck Pond location (23; Figure 2) draining into a steeply dropping and grated culvert (24; Figure 2) adjacent to S Barton Street. The piped drainage crosses S Barton Street and 4th Avenue S and resurfaces to the northeast at a culvert (25; Figure 2) in Marra Farms (a King County park). In Marra Farms Park, the drainage flows north at the surface (26; Figure 2) for several hundred feet to a culvert inlet (27; Figure 2). At this location, the water enters the City of Seattle storm drain system (28; Figure 2), ultimately draining to the Duwamish River. The water travels in pipes, generally north (29; Figure 2) to the outfall at 7th Avenue S and the Duwamish River (30; Figure 2).

Conclusion

Previous unofficial sources have shown a variety of pathways for drainage flowing from the JTF site. One of these sources has indicated surface runoff, from what we have called the North Drainage, flows directly to the Turkey Duck Pond location. We have observed and documented that this is not the case; flow from only the South Drainage reaches the Turkey Duck Pond location.

The water flowing in the North Drainage starts on, or directly adjacent to, the western vicinity of the JTF in AOC 8. There is no evidence of any surface connection to AOC 8 from other locations, rather, water flowing from this area begins as expressed groundwater at the base of a long slope. Only short segments of the flow path are at the surface before the water enters into a pipe at Old Myers Way and apparently does not resurface. The surface segments include flows in AOC 3, AOC 4, and AOC 8, and between Myers Way S and Old Myers Way.

Water flowing in the South Drainage begins as subsurface drainage from JTF, as collected unconfined surface drainage, or (in two locations) as surface drainage from swales located south of the JTF. The drainage is in pipes for the greatest extent of the flow path, with the exception of short segments in three locations: between Myers Way S and Old Myers Way, in the Turkey Duck Pond location, and in Marra Farms Park. After Marra Farms Park, the drainage enters pipes that convey stormwater and does not resurface until reaching the outfall at the Duwamish River.

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Previous documents prepared for the JTF site¹ have identified the short segment of open channel in AOC 4 (North Drainage) as Hamm Creek, or a "lost fork" of Hamm Creek, and have indicated that site runoff flows east or southeast to discharge via surface flow at the Duwamish River. Some of these documents indicated that JTF site runoff enters a restored segment of the Hamm Creek channel just upstream from its confluence with the Duwamish River at approximately rivermile 5.0 (in the vicinity of S 96th Street). The investigations on which this memo is based corrects this misunderstanding. Because JTF site runoff enters piped stormwater conveyance systems, rather than the restored channel of Hamm Creek, previous environmental review documents conservatively evaluated the prospective effects of drainage from the JTF site.

¹ Previous documents that incorrectly reported the off-site drainage route for JTF site runoff, prior to this investigation, include the JTF site SEPA Checklist (3/31/03), the response to Richard Robohm (Ecology): additional information regarding the on-site and off-site mitigation sites (8/04/06); the draft Mitigation Plan (AMEC, 10/16/06); the Water Quality Compliance and Sediment Quality Compliance Memo (CH2M Hill, 11/06/06); the JARPA submitted to Ecology for the 401 Certification decision and CZM consistency determination (11/06/06); and the transmittal letter to King County DDES that accompanied the application for pre-application meeting to discuss the Duwamish site habitat restoration/enhancement project (12/05/06). These documents are corrected by reference in this memo.

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Table 1 Documentation of Information Sources for Drainage Routes from JTF

Note Number	Description	Source	Type
<i>North Drainage</i>			
1	Groundwater expression	K. Dunkin, E. Christensen	Visual
2	Culvert inlet	K. Dunkin, E. Christensen	Visual
3	Culvert outlet	K. Dunkin, E. Christensen	Visual
4	Surface drainage through AOC 8	JTF Construction Documents, Site Survey	
5	Culvert inlet	JTF Construction Documents, Site Survey	
6	Culvert outlet	JTF Construction Documents, Site Survey	
7	Surface drainage through AOC 4	JTF Construction Documents, Site Survey	
8	Culvert inlet beneath Myers Way S.	E. Christensen; M. Gray	Tracing Sticks
9	Culvert outlet	E. Christensen; M. Gray	Tracing Sticks
10	Surface drainage between Myers Way S. and Old Myers Way S.	E. Christensen; M. Gray	Visual
11	Culvert inlet beneath Old Myers Way S.	E. Christensen; M. Gray	Tracing Sticks
	No outlet identified		None
11A	Catch basin on west side of SR-509		Tracing Sticks
	No outlet identified		None

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Note Number	Description	Source	Type
<i>South Drainage</i>			
12	South inlet south of JTF	JTF Construction Documents	
13	Catch basin in entrance road	JTF Construction Documents	
14	Vertical inlet south of JTF	JTF Construction Documents	
15	Subsurface drainage system	JTF Construction Documents	
16	Stormwater pond inlet	JTF Construction Documents	
17	Manhole at AOC 3	JTF Construction Documents	
18	Standpipe at AOC 3	E. Christensen; M. Gray	Tracing Sticks
19	Culvert outlet east of Myers Way	E. Christensen; M. Gray	Tracing Sticks
20	Surface drainage between Myers Way S and Old Myers Way S.	E. Christensen; M. Gray	Visual
21	Vertical inlet at Old Myers Way S.	E. Christensen; M. Gray	Tracing Sticks
22	Culvert outlet at Turkey Duck Pond	E. Christensen; M. Gray	Tracing Sticks
23	Surface drainage at Turkey Duck Pond	K. Dunkin, E. Christensen; M. Gray	Visual
24	Culvert inlet at Barton and 4th Avenue	SPU Construction Documents	
25	Culvert outlet at south end of Marra Farms Park	SPU Construction Documents	
26	Surface drainage in Marra Farms Park	K. Dunkin, M. Lo SPU Design Documents	Visual
27	Culvert inlet at north end of Marra Farms Park	K. Dunkin, M. Lo SPU Design Documents	Visual
28	Inlet connection to City of Seattle drainage	M. Lo, SPU Design Documents	

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29	Route of drainage in storm drainage system to Duwamish River outfall	M. Lo, SPU GIS	
30	Outfall at the Duwamish River	SPU GIS	