

**DATE:** July 26, 2006

**TO:** Karen Keesecker, Planning Department

**THRU:** Kristi Bischofberger, Watershed Administrator  
Watershed Management Services

**FROM:** Scott R. Wheaton, Watershed Scientist  
Watershed Management Services

**SUBJECT:** Legacy Pointe Subdivision (Forest Heights LLC) Watercourses

Karen, as you requested, WMS has completed reconnaissance mapping of watercourses downgradient from Legacy Pointe Subdivision, parcel ID 02018119, south of 172<sup>nd</sup> Avenue and west of Goldenview Drive (Figure 1). Current mapping appends to and updates earlier stream and drainageway mapping completed by WMS in 2002 and 2005. The results of this and earlier field mapping of the Legacy Pointe parcel itself are summarized below.

### **Watercourse Mapping**

Field reconnaissance mapping of the area was completed on July 11, 2006 by Scott R Wheaton. Field traverse was very difficult, requiring navigation down steep slopes densely vegetated with alder and devils club. At the westward extent of field traverses, deep, steep-sided ravines were choked with devils club exceeding three meters in height creating a dense overlapping canopy and making visual navigation very difficult. The area also showed abundant sign of bear activity including fresh scat and rooting throughout, and a moose calf kill from earlier this season. Weather was sunny and warm and work proceeded without incident.

All watercourse features (streams and drainageways) were approximately located in the field and on base ortho-imagery applying WMS' hydrography criteria (WMS document WMP APg04001, 'Municipal Stream Classification: Anchorage, Alaska', January 2004) and map-grade mapping standards (WMS document APg01001, 'Municipality of Anchorage Stream Mapping Standards, ver. 1.04', May 2005). Mapping during this effort was confined to the area downgradient and generally west of the subject parcel. Features identified during this mapping effort have been tied to watercourse mapping done in 2002 and 2005. Mapping reported here supplants any overlapped features from earlier mapping.

Field mapping was done by starting at known watercourse feature locations mapped in earlier efforts along the west boundary of the parcel (along the gas line access trail), and traversing downhill following the characteristic and topographic trace of the feature. Where conditions became impassable due to dense vegetation and steep-sided ravines, a return traverse to the gas line trail was made along adjacent interfluvial slopes where vegetation tended to be more open. The next watercourse feature was then selected and another downhill traverse begun. No watercourses were mapped in the field entirely to the base of the cliffs bordering Potter's Marsh due to the difficult vegetation and terrain conditions.

To help define feature locations, GPS data were collected at 42 field points in WGS 1984 Datum using a Trimble GeoExplorer 3 mobile receiver fitted with an external antenna mounted on a 2.5 meter mast. All GPS data were differentially corrected using Trimble Pathfinder ver. 2.90 software and base station files obtained from the Anchorage National Geodetic Survey CORS station (<http://www.ngs.noaa.gov/CORS/cors-data.html>). All feature points contained sufficient valid positional data for feature location analysis. Horizontal precision of positional data for features averaged 2.2 meters at 95% confidence. Standard deviation of position points for each feature averaged 1.37 meters. Corrected feature location data including latitude and longitude coordinates are listed in Table 1.

Alignments of stream features were estimated and plotted using the field GPS location data along with MOA compressed 2002 USGS 0.3 meter ortho-imagery (usgs\_1ft\_ortho.sid), MOA 10 foot (contours10ft.shp) and 4 foot (MOA4ft.shp) contour elevation data, and are shown in Figure 2. Stream locations plotted at GPS data points are estimated to have horizontal accuracies consistent with WMS' map-grade survey standards. Locations plotted without GPS supporting data are predominantly dependant upon interpretation of contour and ortho-imagery and may have significant horizontal error. The results of this field mapping also suggest a particularly notable apparent vertical error in the LIDAR-based MOA4ft data along the more heavily vegetated steeper ravine features. The LIDAR data tends to show a broad sloping drainageway along the line of features otherwise identified as steep-sided ravines during GPS mapping. Based on these conflicting results it seems likely that even after post-processing the LIDAR contour mapping interprets the tops of the thickly overlapping devils club vegetation as a last-return ground surface signal rather than the ravines themselves. Despite these difficulties, the stream features shown in Figure 2 are believed to reasonably represent the presence and location of primary stream and drainageway features receiving flows from adjoining watercourses mapped on the Legacy Pointe parcel. However, it should also be noted that the entire downgradient area was not traversed due to dense vegetation blocking the steep drainage ravines and the general difficulty in traversing the area. As a result of these difficulties, a particularly important watercourse draining the southwest end of the Legacy Pointe parcel was not mapped at all below the gas line trail. Mapping the alignment of this feature is particularly important as it may carry significant runoff from the Legacy Pointe development and most probably would discharge these flows to the Potter Valley Drive ditchline. Confirmation and additional mapping will have to await removal of some the more dangerous and difficult conditions when leaf—off occurs this fall or prior to leaf—out early next spring. Any additional streams discovered during later mapping must be added to mapping reported here.

### **Watercourse Mapping Results**

Current mapping identified five primary stream features and four major drainageways exiting the Legacy Pointe parcel, all draining to Potter Marsh receiving waters (Figure 2). Despite the single receiving water (Potter Marsh), in general, the drainage off Legacy Pointe is divergent—the surface is broadly convex and drainage tends to radiate outward. This is exemplified by the fact that LSC-30, the northernmost stream feature, drains to the mainstem of Little Survival Creek to the north, while the southern most watercourse draining Legacy Pointe (stream 5 in figure 2) drains across Potter Valley Drive. Across Legacy Pointe itself this divergent character

is reflected in many, relatively narrow and long subdrainage basins aligned along the radial fall lines (i.e., subdrainage basins 1, and 4 through 10 in Figures 1 and 2).

However downgradient of Legacy Pointe, the alignment of many of these same watercourses, both streams and drainageways, are strongly influenced by a unique topography and geology. During the last major stillstand of the Turnagain Arm piedmont glacial lobe, the glacier draped over a bedrock shoulder and terminated just north of Potter Valley Drive and along the west margin of Legacy Pointe. As the glacier front receded, a series of broadly arcuate ridges of morainal sediment were left behind along the lower hillside in this area (Figure 3). These ridges now present an arcuate stepwise topography across the hillslope below Legacy Pointe, with the relatively broad upper surfaces of each ridge dropping abruptly down its facing rampart to the surface of the next lower morainal ridge.

The alignment of streams and drainageways tend to be directed by these ridges of sediments. Streams tend to drop straight down the face of the steep ridge ramparts, forming deep ravines down each rampart face. As they exit off the bottom of a rampart face, however, the small streams tend to lose integrity along broad swales on the gently sloping upper surface of the next lower ridge. Channels for these small features are often broad, poorly defined and intermittent along the ridge surfaces until they re-integrate where they flow down the next steep ridge face. Conversely, their channels down the ridge ramparts are extraordinarily deeply entrenched and sharply defined for such small stream features. For example, the stream channel section near GPS point 16 (Figure 2) along LSC-10 (stream 2 in Figure 2) typically has a bottom width of about 1 to 2 meters, steeply sloping 1:1 sides, and an entrenchment below adjacent interfluvial surfaces of 5 to 7 meters. Despite these influences on individual stream channel character, the overall arcuate pattern of the series of ridges has also helped to focus and integrate the multiple stream features into a single network. With the exception of the southernmost stream feature (which may now be captured by ditching along Potter Valley Drive), streams and drainages exiting from about two-thirds of the length of the west boundary of Legacy Pointe ultimately become integrated into a single stream channel (located at the base of the bedrock cliffs next to Potter Marsh and approximately along the western projection of the southern boundary of the Legacy Pointe parcel).

### **Comments and Recommendations**

Several unusual characteristics of this drainage area should be recognized and considered in any drainage analysis and design for Legacy Pointe. These include:

- the radial, divergent nature of natural drainage on the Legacy Pointe parcels,
- the presence of sharp breaks in slope along downgradient drainage alignments (across the morainal ridge faces),
- the downstream convergent stream network,
- the possible capture of a portion of natural drainage from the Legacy Pointe parcel by the Potter Valley Drive ditch, and
- MOA 4-foot contour data inconsistent with field mapping.

Natural drainage across Legacy Pointe is divergent, spreading out runoff from this area across a large downstream drainage area (Figure 1). Development (including construction of roads

typically across the fall line) will tend to concentrate runoff and focus it to fewer subdrainage basins. Careful consideration should be given to how runoff flows are combined to avoid intensification of downstream impacts or focus of flows into more sensitive drainages.

Downstream drainages cross a series of steep morainal ridges (Figure 3). Increased post-development peak flows directed across the steep faces of these ridges could dramatically increase erosion and associated sedimentation along the ridge surfaces and into Potter Marsh.

A major portion of Legacy Pointe drainage enters a convergent stream network. This convergent network will naturally focus all post-development flows that are directed into this small stream system. Timing of downstream peak flows are likely to be additive and should be explicitly addressed in designing peak flow controls.

Subdrainage basins 10 and 11 and the southernmost watercourse/stream feature exiting Legacy Pointe (stream 5) appear to drain to the ditch along Potter Valley Drive (location of this drainage will be confirmed this late fall or next early spring). In addition to the potential impacts identified above, inadequately controlled post-development peak flows directed through this drainage system could also significantly impact Potter Valley Drive drainage and road systems through erosion, sedimentation and icing problems. (Also note that in order to divert flows directly to Potter Creek, the discharge point from Legacy Pointe would have to be located about 1500 feet above the western boundary of the subdivision or diversion ditching would have to be constructed outside the property boundaries.)

Finally, LIDAR-generated MOA 4-foot contour mapping was not consistent with field mapping results. Steep-sided, deeply entrenched watercourses mapped in the field are not expressed in MOA's 4-foot contour mapping. Rather post-processed LIDAR data appeared to interpret the top of the dense predominant devil's canopy as the last-return ground feature. Detailed design of controls for Legacy Pointe post-development peak storm water flows may require ground survey of downgradient flow lines in order to allow adequate assessment of hydrology and hydraulics.

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Legacy Pointe (Forest Heights LLC)  
July 26, 2006

**Table1: West Forest Heights Feature Location Data**  
July 11, 2006

Featre_Type	Line_Type	Node_Type	Field_ID	Notes	Offset	OffsetAzim	Max_PDOP	Rcvr_Type	GPS_Date	GPS_Time	Datafile	Unflit_Pos	Horz_Prec	Std_Dev	Latitude	Longitude	Point_ID
Stream	CenterLine		1		0	0	7.2	GeoExplorer 3	7/11/2006	08:29:31am	R071117A.cor	41	3.8	1.460431	61.065198143	-149.78726735	1
Road		Divide	2		0	0	2.2	GeoExplorer 3	7/11/2006	08:34:57am	R071117A.cor	22	1.6	0.601031	61.063439085	-149.78957532	2
CDrngwy			3	ditch line frm e	0	0	2.3	GeoExplorer 3	7/11/2006	08:38:51am	R071117A.cor	119	1.6	0.395826	61.063254578	-149.78960666	3
NDrngwy	CenterLine		4		0	0	2.6	GeoExplorer 3	7/11/2006	08:47:15am	R071117A.cor	40	1.7	0.424161	61.062595880	-149.78926849	4
Road		Divide	5	w shldr	0	0	2.7	GeoExplorer 3	7/11/2006	08:54:12am	R071117A.cor	44	1.7	1.443390	61.061651990	-149.78886803	5
Stream	CenterLine		6	w shldr	0	0	6.6	GeoExplorer 3	7/11/2006	08:56:27am	R071117A.cor	38	4.2	0.919789	61.061170555	-149.78868868	6
Road		Divide	7	w shldr	0	0	2.8	GeoExplorer 3	7/11/2006	09:01:02am	R071117A.cor	49	1.7	1.244576	61.060897340	-149.78855792	7
Stream	CenterLine		8		0	0	6.2	GeoExplorer 3	7/11/2006	09:07:58am	R071117A.cor	21	3.1	4.342165	61.061081752	-149.78904246	8
NDrngwy	CenterLine		9		0	0	5.3	GeoExplorer 3	7/11/2006	09:12:51am	R071117A.cor	26	2.3	0.457275	61.060782518	-149.78961737	9
NDrngwy	CenterLine		10		0	0	3.0	GeoExplorer 3	7/11/2006	09:17:12am	R071117A.cor	25	1.7	0.424027	61.060688332	-149.79016580	10
NDrngwy	CenterLine		11		0	0	4.5	GeoExplorer 3	7/11/2006	09:19:11am	R071117A.cor	31	2.0	2.999324	61.060551624	-149.79071068	11
NDrngwy	CenterLine		12		0	0	5.8	GeoExplorer 3	7/11/2006	09:22:11am	R071117A.cor	28	2.4	1.434127	61.060267303	-149.79105135	12
Stream	CenterLine		13		0	0	3.4	GeoExplorer 3	7/11/2006	09:24:16am	R071117A.cor	41	2.4	0.513103	61.060035642	-149.79100061	13
Stream	CenterLine		14		0	0	3.0	GeoExplorer 3	7/11/2006	09:28:49am	R071117A.cor	34	1.7	1.379721	61.060171331	-149.79108383	14
Stream	CenterLine		15		0	0	3.2	GeoExplorer 3	7/11/2006	09:33:11am	R071117A.cor	39	1.8	1.674006	61.060060899	-149.79161161	15
NDrngwy	CenterLine		16		0	0	3.1	GeoExplorer 3	7/11/2006	09:35:48am	R071117A.cor	27	1.8	0.805385	61.060035801	-149.79210011	16
NDrngwy	CenterLine		17		0	0	2.9	GeoExplorer 3	7/11/2006	09:37:44am	R071117A.cor	32	1.7	1.146962	61.059982686	-149.79224351	17
Other			18		0	0	3.8	GeoExplorer 3	7/11/2006	09:46:23am	R071117A.cor	62	2.2	2.560579	61.060201951	-149.79043901	18
Stream	CenterLine		19		0	0	5.8	GeoExplorer 3	7/11/2006	09:58:33am	R071117A.cor	43	2.4	2.114715	61.060252483	-149.78829593	19
Stream		Confluence	20		0	0	2.5	GeoExplorer 3	7/11/2006	10:01:28am	R071117A.cor	36	1.5	0.567456	61.060094277	-149.78823328	20
Stream	CenterLine		21	l shldr	0	0	2.8	GeoExplorer 3	7/11/2006	10:03:51am	R071117A.cor	88	1.4	3.881274	61.059917427	-149.78828278	21
Stream	CenterLine		22	r shldr	0	0	3.6	GeoExplorer 3	7/11/2006	10:05:24am	R071117A.cor	47	1.5	0.219649	61.059889697	-149.78839762	22
Stream	CenterLine		23		0	0	3.5	GeoExplorer 3	7/11/2006	10:08:11am	R071117A.cor	21	1.7	0.825164	61.059681873	-149.78870958	23
Stream	CenterLine		24		0	0	2.7	GeoExplorer 3	7/11/2006	10:10:58am	R071117A.cor	23	1.6	0.283283	61.059659694	-149.78897080	24
Stream	CenterLine		25		0	0	2.3	GeoExplorer 3	7/11/2006	10:12:17am	R071117A.cor	20	1.4	0.230628	61.059660527	-149.78915783	25
Stream	CenterLine		26		0	0	6.9	GeoExplorer 3	7/11/2006	10:14:40am	R071117A.cor	36	3.1	2.587716	61.059614778	-149.78952236	26
Stream	CenterLine		27		0	0	3.5	GeoExplorer 3	7/11/2006	10:16:35am	R071117A.cor	31	1.5	0.603614	61.059513739	-149.78977029	27
Stream	CenterLine		28		0	0	3.5	GeoExplorer 3	7/11/2006	10:22:25am	R071117A.cor	21	1.9	1.676188	61.059362061	-149.78997400	28
Stream	CenterLine		29		0	0	3.1	GeoExplorer 3	7/11/2006	10:23:32am	R071117A.cor	23	2.0	3.296867	61.059226740	-149.79009426	29
Stream	CenterLine		30		0	0	4.5	GeoExplorer 3	7/11/2006	10:28:00am	R071117A.cor	40	1.9	0.627582	61.059216509	-149.79036371	30
Road		Divide	32	w shldr	0	0	2.0	GeoExplorer 3	7/11/2006	10:36:59am	R071117A.cor	45	1.4	0.431228	61.059212638	-149.78834192	31
Other	CenterLine		33		0	0	2.5	GeoExplorer 3	7/11/2006	10:40:52am	R071117A.cor	39	1.7	0.292410	61.057605848	-149.78842060	32
Road		Divide	34	w shldr	0	0	2.6	GeoExplorer 3	7/11/2006	10:42:24am	R071117A.cor	35	1.7	0.912968	61.057188687	-149.78833500	33
Stream	CenterLine		35		0	0	2.7	GeoExplorer 3	7/11/2006	10:51:32am	R071117A.cor	33	1.9	0.862257	61.058398078	-149.78835272	34
Stream	CenterLine		35		0	0	3.3	GeoExplorer 3	7/11/2006	10:54:08am	R071117A.cor	21	1.9	0.868499	61.059618951	-149.78831573	35
Road	CenterLine		36		0	0	7.2	GeoExplorer 3	7/11/2006	11:01:23am	R071117A.cor	21	4.2	2.600801	61.062878100	-149.78801867	36
Road	CenterLine		37		0	0	4.4	GeoExplorer 3	7/11/2006	11:02:28am	R071117A.cor	20	2.8	0.683117	61.062782130	-149.78733786	37
Road	CenterLine		38		0	0	3.8	GeoExplorer 3	7/11/2006	11:03:35am	R071117A.cor	21	2.2	0.903760	61.062990895	-149.78670726	38
Road	CenterLine		39		0	0	7.0	GeoExplorer 3	7/11/2006	11:04:36am	R071117A.cor	22	2.3	1.839075	61.063217530	-149.78614465	39
Road	CenterLine		40		0	0	7.2	GeoExplorer 3	7/11/2006	11:05:44am	R071117A.cor	27	5.8	3.576040	61.063744094	-149.78573226	40
Stream	CenterLine	XCulvrtIn	41		0	0	7.4	GeoExplorer 3	7/11/2006	11:08:00am	R071117A.cor	24	3.8	1.855326	61.063715304	-149.78549014	41
Stream	CenterLine	XCulvrtOut	42		0	0	6.3	GeoExplorer 3	7/11/2006	11:13:46am	R071117A.cor	24	2.7	1.416284	61.063749300	-149.78577991	42

Figure 1: Legacy Pointe (Forest Heights LLC) Vicinity

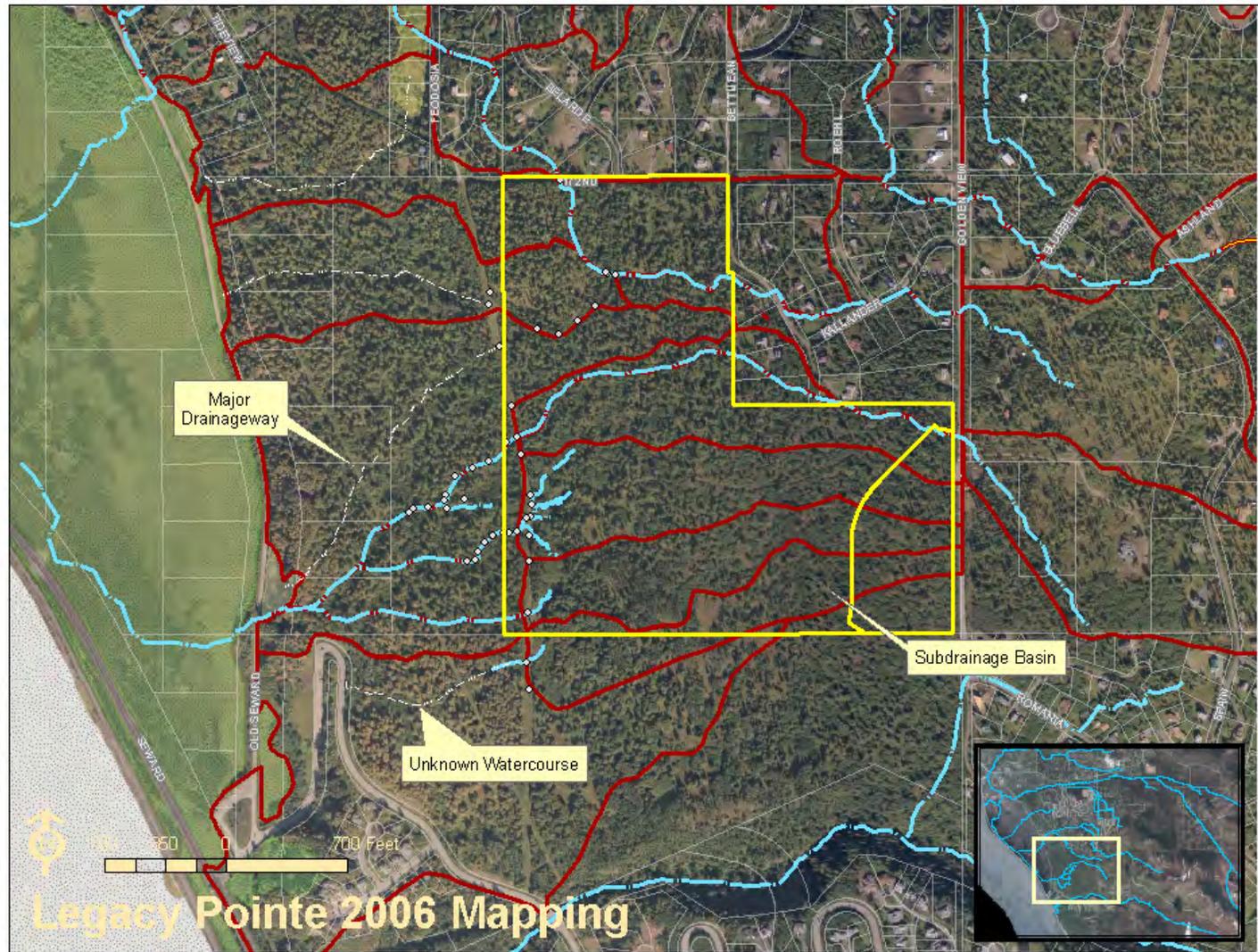


Figure 2: Legacy Pointe (Forest Heights LLC) Watercourses

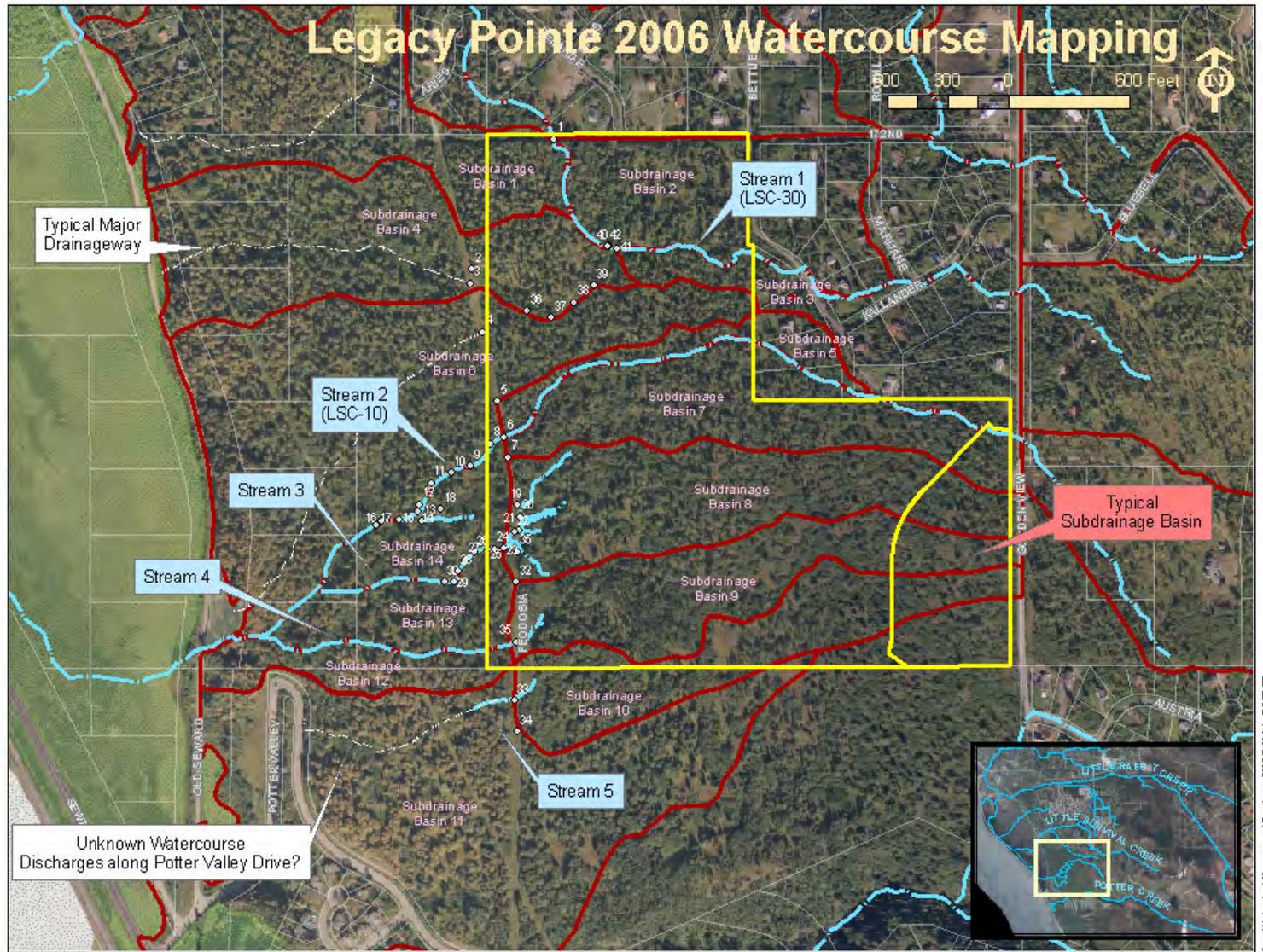
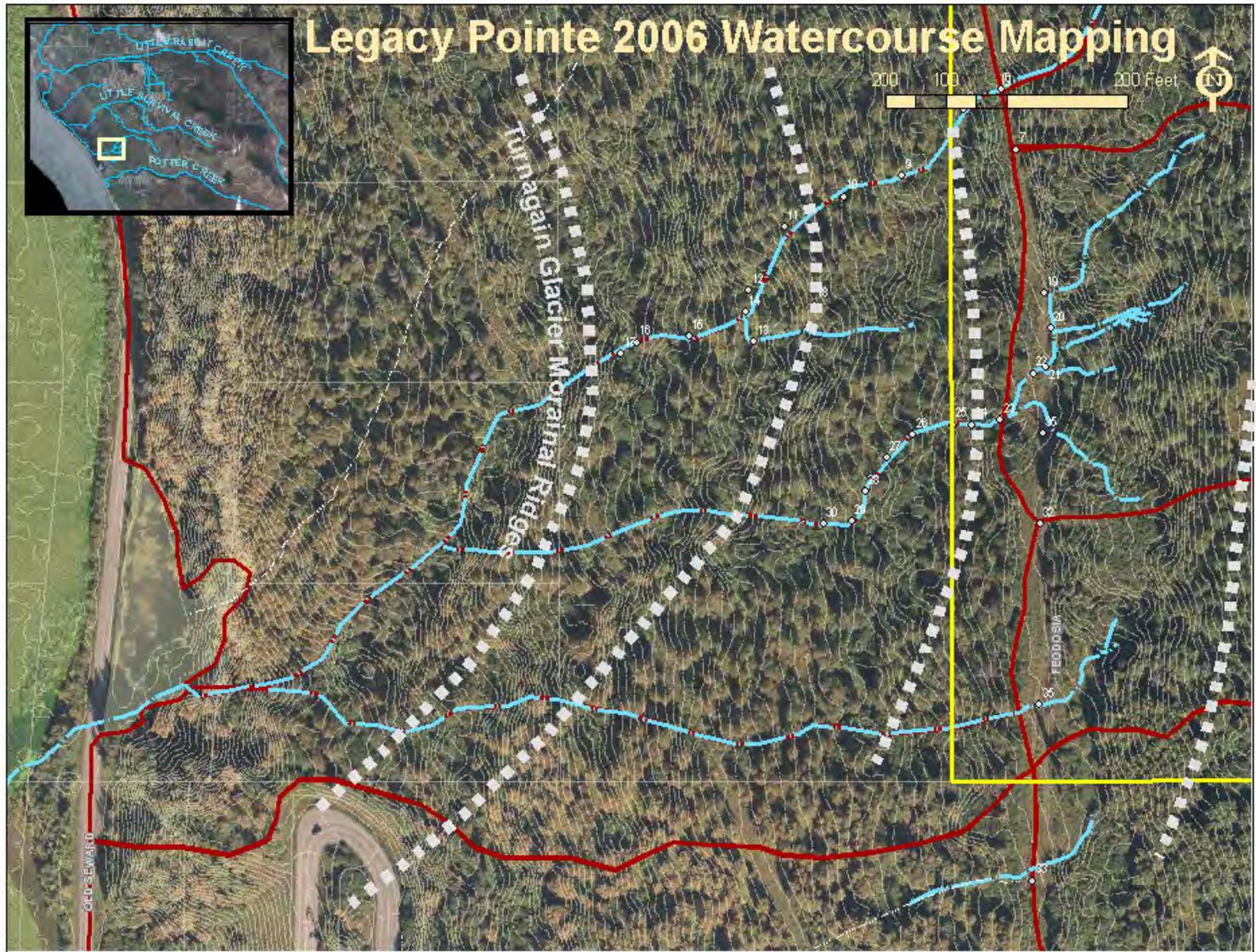


Figure 3: Legacy Pointe (Forest Heights LLC) Drainage Pattern



Map: Watershed Management Services, PMSE, MOA-0507-20