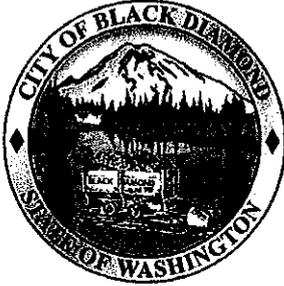


31.

Technical Memorandum on Construction Traffic
Impacts, Triad Associates

April 22, 2014



REVISION/CORRECTION SUBMITTAL FORM



Submittal Requirements:

All revisions / correction submittals MUST contain the following:

1. A completed City of Black Diamond Revision/Correction submittal form
2. Two (2) sets of revised and/or corrected drawings/sheets (wet stamped by architect, if applicable).
3. Revised structural calculations, if applicable (must be stamped by engineer)
4. A written letter to the City that shows an itemized summary of your submittal (must include sheet and detail numbers)
5. All changes **MUST BE CLOUDED** or **HIGHLIGHTED** on each plan set

Date: 4/28/14

Permit #: PLN13-0027

Property Address: SEE THE VILLAGES MRD PHASE 2 PRELIM. PLAT C PROJECT NARRATIVE

Project Name: THE VILLAGES MRD PHASE 2 PLAT C

Contact Person: COUN LUND

Phone: (425) 898-2100

Email: CLUND@YARROWBAYHOLDINGS.COM

TYPE OF SUBMITTAL:

REVISION: A change the applicant has made to a plan that is either:

1. An approved plan already issued by the City or
2. A project under current plan review

CORRECTION: An applicant response to a correction letter written by the City to the applicant

Permit Issued? Yes No *A plan check fee for revision is \$84 per hour with a minimum of \$42 for ½ hour

Please describe revision/correction submittal:

THE VILLAGES MRD PHASE 2 PLAT C - CONSTRUCTION TRAFFIC IMPACTS

Sheets Affected: If more than two (2) sheets will be changed, please submit two (2) new full sets of plans. Revisions on issued permits only require submittal of the affected sheets.

For City Use Only:

<u>REQ'D APPROVAL</u>	<u>CHECKED BY</u>	<u>ROUTE TO</u>	<u>DATE</u>	<u>INITIAL</u>	<u>COMMENTS</u>	<u>FEES</u>
()	1. BUILDING	_____	_____	_____	_____	_____
()	2. PLANNING	_____	_____	_____	_____	_____
()	3. FIRE	_____	_____	_____	_____	_____
()	4. PW	_____	_____	_____	_____	_____
()	5	_____	_____	_____	_____	_____

TOTAL \$



TECHNICAL MEMORANDUM

Date: April 22, 2014 **TG:**

To: Colin Lund – YarrowBay Holdings

From: Kevin L. Jones, P.E., PTOE – Transpo Group

Subject: The Villages MPD Phase 2 Plat C – Construction Traffic Impacts

This memo addresses the anticipated traffic impacts associated with construction activities for developing Phase 2 Plat C of The Villages Master Planned Development (MPD).

Construction Phasing and Timing

Construction associated with the development of Phase 2 Plat C of The Villages MPD will initially include earthwork and installation of utilities followed by vertical construction of residential dwelling units. Earthwork and utility construction includes the grading of the site, installing roadways, and installation of necessary utilities such as power, water and sewer. This phase of construction is anticipated to occur over a five-month period from July 2015 through November 2015 and is designed to balance, as much as possible, the use of cut and fill materials on-site and minimize the amount of construction traffic associated with hauling earthwork. Vertical construction will likely begin in December 2015 after all earthwork and utility construction has been completed and is anticipated to occur over a 12-month period, ending by November 2016.

Construction Trip Generation

The amount of construction traffic associated with the development of Phase 2 Plat C was estimated for the number of truck trips as well as employee or crew trips. The construction timeline and schedule were also reviewed to understand the volume of construction traffic anticipated on a daily basis as well as during the weekday PM peak hour at adjacent street traffic (one-hour period of greatest demand between the hours of 4:00 p.m. and 6:00 p.m.). The primary hours for construction are between 7:00 a.m. and 3:00 p.m. with most truck traffic avoiding delays associated with traffic congestion during the PM peak hour of adjacent street traffic; however, these calculations conservatively assume that some construction traffic would occur during the weekday PM peak hour as summarized below. The truck traffic assumed during the PM peak hour would be single-unit trucks as trucks larger than a single-unit will not be accepted on site after 3:30 p.m. In addition, it was assumed that each construction worker would arrive and depart in a single-occupant vehicle even though it is likely that some construction workers would carpool to/from the project site, effectively reducing the trip generation estimates identified in this memo.

During earthwork and utility construction, it is estimated that Phase 2 Plat C will generate approximately 24 crew trips and 12 truck trips on a daily basis with up to two crew trips and one truck trip occurring during the weekday PM peak hour of adjacent street traffic. During the vertical construction of residential dwelling units, the project is estimated to generate approximately 204 crew trips and 14 truck trips on a daily basis with up to 17 crew trips and one truck trip occurring during the weekday PM peak hour.

Table 1 provides a summary of the daily and weekday PM peak hour construction trips anticipated for Phase 2 Plat C. This data was derived from detailed trip generation calculations and construction assumptions provided in the attached memorandum from Triad Associates. It should be noted that the data related to daily traffic from the Triad Associates memorandum represents round trips, which were doubled in the table below to account for each entering and exiting trip end associated with daily trips.

Table 1. Construction Trip Generation Summary – The Villages MPD Phase 2 Plat C

Construction Type	Weekday Daily Trips ¹			Weekday PM Peak Hour Trips		
	Crew	Truck	Total	Crew	Truck	Total
Earthwork and Utilities	24	12	36	2	1	3
Vertical	204	14	218	17	1	18

1. Daily trips identified in the Triad Associates memorandum represent round trips / individual trip ends at the project site, and were doubled in this memorandum to account for each entering and exiting trip end associated with a daily trip.

Construction Impacts

Construction traffic generated by Phase 2 Plat C will total fewer than 220 daily trips and fewer than 20 weekday PM peak hour trips at peak activity. By comparison, as disclosed in *The Villages MPD - Phase 2 Plat C Traffic Impact Study* dated December 19, 2013, Phase 2 Plat C will generate approximately 1,700 daily vehicular trips and up to 137 net new PM peak hour trips once all residential units are occupied, nearly eight times the amount of traffic generated by construction activity. And while this study concluded that no intersection improvements (mitigation measures) would be required in conjunction with the completed plat, the same conclusion holds as it relates to mitigating construction traffic impacts because the number of trips generated by construction activity is (significantly) less than the number of trips anticipated post-construction.

Construction Management Plan

A construction management plan will be developed by the Master Developer in coordination with the City of Black Diamond to provide for a safe and efficient construction site and minimize the impacts to traffic operations in the area as required by Section 1.17 of the City of Black Diamond Engineering Design and Construction Standards. This plan will minimize off-site construction impacts through containing equipment, materials and workers on-site as much as possible and accommodating staging, construction facilities and parking on-site. Specific transportation-related items anticipated to be addressed in a construction management plan include:

- **Truck Routes** – identifying specific haul routes for trucks, which will avoid impacts to local residential streets.
- **Noise** – minimizing noise impacts associated with construction on-site as well as from haul trucks on the roads.
- **Parking** – identifying parking areas for employees as well as staging areas for trucks and materials.
- **Access** – Identifying specific areas for access that would likely require safe controlled access for large trucks to and from the site.
- **Compute Trip Reduction** – encouraging carpooling and other ride sharing by employees to minimize the number of single occupant vehicle trips on site.

In addition, Sheet UA1 of the “Utility Availability/Sensitive Areas” plan for Phase 2 Plat C includes a preliminary haul route plan that has two plat notes that provide additional mitigation to minimize construction impacts to SE Green Valley Road and allow the City an opportunity to review and approve construction traffic control designs. The notes read as follows:

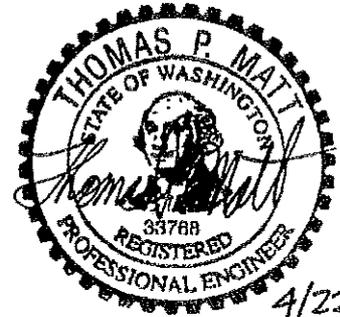
1. Master Developer shall include the following provision in clearing, grading and construction contracts: “Except for the westerly 1,000 feet of SE Green Valley Road (from SR 169), SE Green Valley Road shall not be used as a construction haul route by contractors or its agents.”
2. Construction traffic control design will be provided as part of final engineering plans for review and approval by the City of Black Diamond.

Attachment: Triad Associates memorandum dated April 22, 2014



MEMORANDUM

Date: April 22, 2014
To: Andrew Williamson
From: Thomas P. Matt, P.E.
Re: The Villages Phase 2 Plat C Construction Trips
Triad Job No.: 10-001
Copies To: Colin Lund



Dear Mr. Williamson:

At the request of BD Village Partners, we have investigated opportunities for reducing the amount of construction traffic associated with The Villages Phase 2 Plat C.

The Villages MPD Condition of Approval No. 110 (set forth in Exhibit C of The Villages MPD Development Agreement on page 23 of 29) states: "Prior to approval of the first implementing plat or site development permit within a phase, the applicant shall submit an overall grading plan that will balance the cut or fill so that the amount of cut or fill does not exceed the other by more than 20%." In compliance with condition, on November 21, 2013, Triad prepared and submitted to the City on behalf of BD Village Partners, LP the attached memorandum and exhibit detailing how Phase 2 of The Villages MPD would limit cut and fill quantities to be within 16% of each other. While this 16% imbalance is well within the limits established by MPD Condition of Approval No. 110, in order to further reduce construction traffic resulting from The Villages Phase 2 Plat C, we were tasked with coming up with implementable strategies to further reduce the earthwork imbalance.

In reviewing Phase 2 Plat C's site grades and typical construction methods, Triad is confident the following additional construction techniques and conditions will further limit construction traffic on the off-site adjoining street network:

- Screen Phase 2 Plat C strippings onsite to obtain topsoil for re-use onsite.
- Rocks obtained through the screening of topsoil on Phase 2 Plat C are to be used as fill or crushed for use as base material onsite.
- Sticks obtained through the screening of topsoil on Phase 2 Plat C are to be "chipped" and used for soft surface trails or erosion protection onsite.
- Import borrow/fill material including outwash soils for gravel base from within The Villages MPD site.
- Stockpile any excess material generated through construction of Phase 2 Plat C within The Villages MPD site for use on future phases.
- Limit deliveries via trucks larger than Single Unit (SU) trucks to before 3:30 Monday – Friday.

Based on implementation of these strategies, Triad has estimated construction truck and vehicle trips associated with the build out of Phase 2 Plat C. The trip generation estimates have been broken down

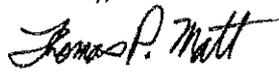
between crew trips and truck delivery trips as well as earthwork and utility construction and vertical construction (buildings). The attached spreadsheets show how assumptions and calculations were used to generate trip estimates for Phase 2 Plat C. And, the attached graphs show the estimated trip distribution along the proposed construction timeline for Phase 2 Plat C.

Earthwork and utility construction crews were estimated to generate 1,200 round trips. Earthwork and utility truck deliveries were estimated to generate 517 round trips. Earthwork and utility construction is anticipated to occur from July 2015 through November 2015. Vertical (building) construction crews were estimated to generate 24,360 round trips. Vertical construction truck deliveries were estimated to generate 1,624 round trips. Vertical construction is currently anticipated to begin in December of 2015 and continue through November of 2016. The vertical construction crew and truck trips have been averaged over this estimated 12 month construction period.

These average crew and truck trips have been graphed based on average trips per day as well as by average PM peak hour trips (see attached graphs).

Please let me know if you have any follow-up questions regarding these construction trip generation calculations.

Sincerely,

A handwritten signature in black ink that reads "Thomas P. Matt". The signature is written in a cursive, flowing style.

Thomas P. Matt, P.E.

Crew Trip Estimate for Construction of The Villages Phase 2 Plat C

Earthwork and Utility Construction Crew Trips

Earthwork and Utilities = 5 months,
 20 work days per month,
 12 crew trucks per day average

Earthwork and Utility Crew Trips = (5 months)*(20 work days/month)*(12 crew trucks/day) = 1,200 Trips

Vertical Construction Crew Trips

Single Family Residence (SFR) Construction = 3 months per SFR
 20 work days per month,
 2 crew trucks per day average

SFR Construction Trips = (3 months)*(20 work days/month)*(2 crew trucks/day) = 120 Trips per SFR

	SFR
# of Units	203
Trips per Unit	120
Total Trips	24360

Total Crew Trips for Phase 2 Plat C: 25,560

Vertical Construction Delivery Truck Trips for Construction of The Villages Phase 2 Plat C

Single Family Residential (SFR) Construction = 8 trips per unit

	SFR
# of Units	203
Trips per Unit	8
Total Trips	1624

The Villages Phase 2 Plat C Estimated Truck Trips

Import for Road & Alley Construction

	LF of Street	Avg Width	Avg Depth	CY	CY/Load	Trips
Road Section - Road A, B & C	5773	35	0.50	3742	20	187
Alley Section	1620	16	0.50	480	20	24
Woonerf Section 1	1237	28	0.50	641	20	32
Woonerf Section 2	551	21	0.50	214	20	11
Sidewalks	5773	10	0.42	898	10	90
				Total =		344

Note: Assumed outwash material from on The Villages site meets requirements for gravel base.

The Villages Phase 2 Plat C Estimated Truck Trips

Other Import Items as Noted

Earthwork assumes grades can be adjusted to provide an earthwork balance or that stockpiling of excess material or borrow as needed can be done on The Villages MPD site.

Stripping the site assumed at 9" of stripping depth
 $(31.3 \text{ acres}) * (43,560 \text{ sf/acre}) * (0.75 \text{ ft}) / 27 = 37,873 \text{ CY}$

1/2 of stripping volume assumed to be sticks and rocks

Sticks to be chipped on site for use on trails

Rock assumed to be placed as fill or crushed and used on site

1/2 of stripping volume assumed to be topsoil that can be used on-site with 10% import volume for mixing

Topsoil Import = $(.5) * (37,873 \text{ CY}) * (0.1) = 1,894 \text{ CY}$

Topsoil Import Trips = $1,894 \text{ CY} / (25 \text{ CY/trip}) = 76 \text{ Trips}$

Bioretention Cells Trips = $((100 \text{ ft})(15 \text{ ft})(4.5 \text{ ft}) / 27) / (20 \text{ CY/trip}) = 13 \text{ Trips}$

Utility Trips - Deliveries of Pipe, Structures, and Bedding

Assume 1 truck trip per 100' of road and woonef construction

Alleys assumed at half of road construction

Trips = $(5,773 \text{ LF} + 1237 \text{ LF} + 551 \text{ LF}) / 100 \text{ LF/trip} + .5(1,620 \text{ LF}) / 100 \text{ LF/trip} = 84 \text{ Trips}$

Subtotal	173 Trips
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The Villages Phase 2 Plat C Construction Trip Estimate

Construction Phase	Crew Trips	Truck Trips	Total Trips
Earthwork and Utility Trips	1200	517	1717
Vertical Construction	24360	1624	25984
	25560	2141	

EW & Utilities

EW & Utilities to occur over 5 months, 20 weekdays/month
(estimated to occur July through November in 2015)

Crew Vehicle Trips total 1,200
 $1,200 / (5 * 20) = 12$ Trips/day

Allowable Work Hours 7AM to 7PM

Assume 1/3 leave before 4PM

Assume 1/3 leave after 6PM

Assume 1/3 leaving between 4PM and 6PM $12/3 = 4$ trips

Hourly Peak Crew Trips = $4/2$ hrs = 2 trips/hr

Truck Trips

$517 / (5 * 20) = 5.2$ trips/day

Deliveries occur throughout the work day 7Am to 7PM

Assume 10% of truck trips occur between 4PM and 6PM $(5.2)(0.1) = 0.52$ trips

Hourly Peak Truck Trips = 0.52 trips/2hrs = 0.3 trips/hr

Vertical Construction

Vertical Construction to occur over 12 months, 20 weekdays/month
(estimated to occur December 2015 through November 2016)

Crew Vehicle Trips total 24,360 trips
 $24,360 / (12 * 20) = 101.5$ trips/day

Allowable Work Hours 7AM to 7PM

Assume 1/3 leave before 4PM

Assume 1/3 leave before 4PM

Assume 1/3 leave after 6PM

Assume 1/3 leaving between 4PM and 6PM $101.5 / 3 = 33.8$ trips

Hourly Peak Crew Trips = $33.8 / 2$ hrs = 17 trips/hr

Truck Trips

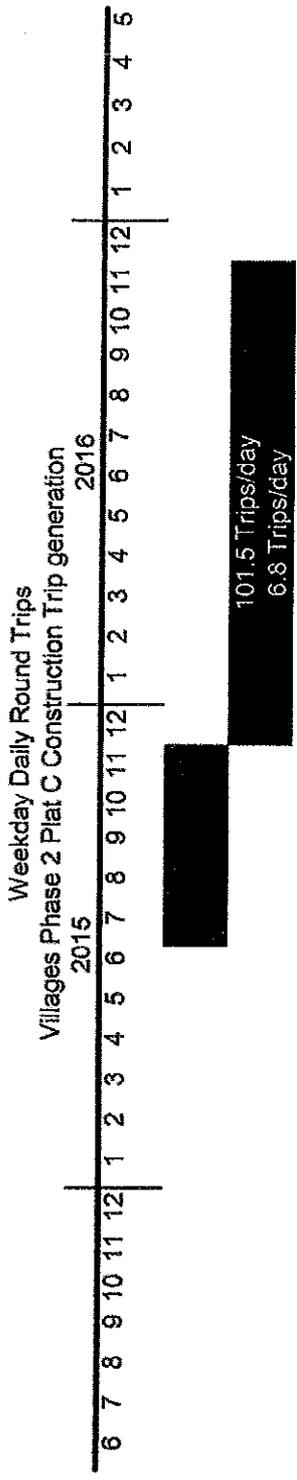
$1,624 / (12 * 20) = 6.8$ trips/day

Delivers occur throughout the work day 7AM to 7PM

Assume 10% of truck trips occur between 4PM and 6PM $(6.8)(0.1) = 0.7$ trips

Hourly Peak Truck Trips = 0.68 trips/2 hrs = 0.34 trips/hr

Note the calculated trips were conservatively assumed to all occur on weekdays, Monday through Friday



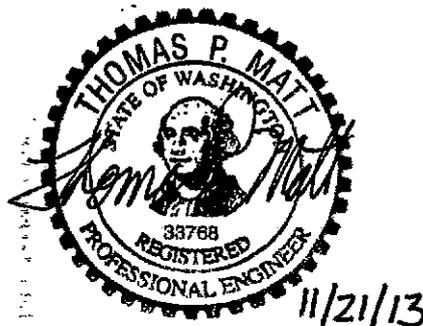
EW & UTIL - Crew
EW & UTIL - Truck
Vert. Const. - Crew
Vert. Const. - Truck

Note: Only single unit truck deliveries will be accepted after 3:30 PM



MEMORANDUM

Date: November 21, 2013
To: Andrew Williamson
From: Thomas P. Matt, P.E.
Re: Phase 2 Overall Grading Plan
Triad Job No.: 05-336
Copies To: Colin Lund



Dear Mr. Williamson:

This memorandum has been prepared and submitted to document the preliminary earthwork quantities for Phase 2 of The Villages and Lawson Hills MPDs. MPD Condition of Approval #110 of The Villages and Lawson Hills MPDs states: "Prior to approval of the first implementing plat or site development permit within a phase, the applicant shall submit an overall grading plan that will balance the cut or fill so that the amount of cut or fill does not exceed the other by more than 20%". Preliminary grading plans for all of Phase 2 of the MPDs have been prepared and sent to Earthwork Services, Inc. for earthwork quantity takeoff. Earthwork quantities for all of Phase 2 have been estimated less the stormwater facility associated with The Villages Phase 1A Preliminary Plat. The Villages Phase 1A Preliminary Plat Condition of Approval #53 states "The stormwater facility located to the south of PP1A and shown on plat sheets RS7 through RS9 dated 8/23/12 shall be designed and built at this time to accommodate all future phases of The Villages MPD that may potentially drain to it". Earthwork quantities for this stormwater facility were not included in this estimate since earthwork quantities associated with the stormwater facility were previously included with the Phase 1A overall grading plan.

The Phase 2 earthwork quantities have been calculated between existing contours and preliminary proposed finish grade contours shown on the Phase 2 preliminary grading plans. The first attachment shows the total earthwork quantities for the Phase 2 portion of The Villages MPD less the stormwater facility as 444,053 CY of cut and 383,689 CY of fill. These cut and fill quantities are within approximately 16% of each other. The second attachment shows the total earthwork quantities for the Phase 2 portion of Lawson Hills MPD as 205,370 CY of cut and 189,892 CY of fill. These cut and fill quantities are within approximately 8% of each other. The total Phase 2 earthwork quantities less The Villages Phase 1A stormwater facility are estimated to be 649,423 CY of cut and 573,581 CY of fill. These combined cut and fill quantities are within approximately 13% of each other. Therefore, Phase 2 of the MPDs are in compliance with Condition of Approval #110 when looked at individually and when combined.

Please let me know if you have any questions on this.

Sincerely,

Thomas P. Matt, P.E.



November 11, 2013

Triad and Associates

RE: Villages

Dear Sirs,

Enclosed please find grid elevation, cut/fill graphics and volumes for this project, which was calculated using the average end area method and the following assumptions:

1. **No stripping was applied to the site.**
2. **A depth of 0" from design elevations to subgrade in the areas.**

TOTAL RAW VOLUMES IN PLACE

(Volumes are in Cubic Yards)

<u>Activity</u>	<u>Area (ft²)</u>	<u>Cut Volume</u>	<u>Fill Volume</u>
Finish Site	5,949,062	444,053	383,689

Please call after you have reviewed this information if you have any questions.

* Raw volumes have not been adjusted to reflect shrink or swell for compaction and expansion and are volumetric areas only.



PO Box 640
1116 1st St.
Cosmopolis, WA 98537

November 12, 2013

Earthwork Services Job# 25240

Jeff Popolow
Triad Associates
12112 115th Ave. NE
Kirkland, WA 98034

RE: Lawson Hills PH2

Dear Jeff,

Enclosed please find grid elevation, cut/fill graphics and volumes for this project, which was calculated using the average end area method and the following assumptions:

1. **No stripping was applied to the site.**
2. A depth of 0" from design elevations to subgrade in **Areas A-C.**

TOTAL RAW VOLUMES IN PLACE
(Volumes are in Cubic Yards)

Activity	Area (ft ²)	Cut Volume	Fill Volume
Finish Site	2,185,485	205,370	189,892

Please call after you have reviewed this information if you have any questions.

* Raw volumes have not been adjusted to reflect shrink or swell for compaction and expansion and are volumetric areas only.