City Council

Monday, December 11, 2017

Committee of the Whole 5:00 p.m.
Regular Meeting 6:00 p.m.

Pictures of the Homer Airport Sunrise courtesy of Travis Smith

City Hall Cowles Council Chambers
491 E. Pioneer Avenue
Homer, Alaska

December 2017- January 2018

Monday 11th: **CITY COUNCIL**
Committee of the Whole 5:00 p.m. and Regular Meeting 6:00 p.m.

Wednesday 13th: **PORT &HARBOR ADVISORY COMMISSION**
Regular Meeting 5:00 p.m.

Thursday 14th: **CANNABIS ADVISORY COMMISSION**
Regular Meeting 5:30 p.m.

Monday 25th: **CLOSED FOR CHRISTMAS**
City Offices will be closed.

Monday 1st: **CLOSED FOR NEW YEARS**
City Offices will be closed.

Wednesday 3rd: **ADVISORY PLANNING COMMISSION**
Work Session 5:30 p.m. and Regular Meeting 6:30

Monday 8th: **CITY COUNCIL**
Work Session 4:00 p.m., Committee of the Whole 5:00 p.m. and Regular Meeting 6:00 p.m.

Regular Meeting Schedule
City Council 2nd and 4th Mondays 6:00 p.m.
Library Advisory Board 1st Tuesday 5:30 p.m. with the exception of
January April August November
Economic Development Advisory Commission 2nd Tuesday 6:00 p.m.
Parks Art Recreation and Culture Advisory Commission 3rd Thursday 5:30 p.m. with the exception of
July, December, January
Planning Commission 1st and 3rd Wednesday 6:30 p.m.
Port and Harbor Advisory Commission 4th Wednesday 5:00 p.m. (May-August 6:00 p.m.)
Cannabis Advisory Commission Quarterly 4rd Thursday 5:00 p.m.

MAYOR AND CITY COUNCILMEMBERS AND TERMS
BRYAN ZAK, MAYOR – 18
DONNA ADERHOLD, COUNCILMEMBER – 18
HEATH SMITH, COUNCILMEMBER – 18
SHELLY ERICKSON, COUNCILMEMBER – 19
TOM STROOZAS, COUNCILMEMBER – 19
RACHEL LORD – 20
CAROLINE VENUTI – 20
City Manager, Katie Koester
City Attorney, Holly Wells

http://cityofhomer-ak.gov/cityclerk for home page access, Clerk's email address is: clerk@ci.homer.ak.us
Clerk's office phone number: direct line 235-3130

HOMER CITY COUNCIL
491 E. PIONEER AVENUE
HOMER, ALASKA
www.cityofhomer-ak.gov

COMMITTEE OF THE WHOLE
5:00 P.M. MONDAY
DECEMBER 11, 2017
COWLES COUNCIL CHAMBERS

MAYOR BRYAN ZAK
COUNCIL MEMBER DONNA ADERHOLD
COUNCIL MEMBER HEATH SMITH
COUNCIL MEMBER TOM STROOZAS
COUNCIL MEMBER SHELLY ERICKSON
COUNCIL MEMBER CAROLINE VENUTI
COUNCIL MEMBER RACHEL LORD
CITY ATTORNEY HOLLY WELLS
CITY MANAGER KATIE KOESTER
CITY CLERK MELISSA JACOBSEN

COMMITTEE OF THE WHOLE AGENDA

1. CALL TO ORDER, 5:00 P.M.

Mayor Zak has requested telephonic

2. AGENDA APPROVAL (Only those matters on the noticed agenda may be considered, pursuant to City Council's Operating Manual, pg. 6)

3. CONSENT AGENDA

4. REGULAR MEETING AGENDA

5. COMMENTS OF THE AUDIENCE

6. ADJOURNMENT NO LATER THAN 5:50 P.M.
Next Regular Meeting is Monday, January 8, 2018 at 6:00 p.m. Worksession at 4:00 p.m. and Committee of the Whole 5:00 p.m. All meetings scheduled to be held in the City Hall Cowles Council Chambers located at 491 E. Pioneer Avenue, Homer, Alaska.

CALL TO ORDER
PLEDGE OF ALLEGIANCE
AGENDA APPROVAL

HOMER CITY COUNCIL
491 E. PIONEER AVENUE
HOMER, ALASKA
www.cityofhomer-ak.gov

REGULAR MEETING
6:00 P.M. MONDAY
DECEMBER 11, 2017
COWLES COUNCIL CHAMBERS

MAYOR BRYAN ZAK
COUNCIL MEMBER DONNA ADERHOLD
COUNCIL MEMBER HEATH SMITH
COUNCIL MEMBER TOM STROOZAS
COUNCIL MEMBER SHELLY ERICKSON
COUNCIL MEMBER CAROLINE VENUTI
COUNCIL MEMBER RACHEL LORD
CITY ATTORNEY HOLLY WELLS
CITY MANAGER KATIE KOESTER
CITY CLERK MELISSA JACOBSEN

REGULAR MEETING AGENDA

Committee of the Whole 5:00 p.m. in Homer City Hall Cowles Council Chambers.

1. CALL TO ORDER, PLEDGE OF ALLEGIANCE

Department Heads may be called upon from time to time to participate via teleconference.

Mayor Zak requests telephonic.

2. AGENDA APPROVAL

(Addition of items to or removing items from the agenda will be by unanimous consent of the Council. HCC 2.08.040.)

3. MAYORAL PROCLAMATIONS AND RECOGNITIONS

A. Mayoral Recognition of Homer High School Students Charlie Menke, Douglas Dean, Phinny Weston and Tucker Weston Page 15

4. PUBLIC COMMENTS UPON MATTERS ALREADY ON THE AGENDA

5. RECONSIDERATION

6. CONSENT AGENDA

(Items listed below will be enacted by one motion. If separate discussion is desired on an item, that item may be removed from the Consent Agenda and placed on the Regular Meeting Agenda at the request of a Councilmember.)

A. Homer City Council unapproved Regular Meeting Minutes of November 27, 2017 City Clerk. Recommend adoption. Page 23

B. **Ordinance 17-43,** An Ordinance of the City Council of Homer, Alaska, Amending the Official Road Maintenance Map of the City of Homer by Adding Ternview Place and Little Fireweed Lane. City Manager/Public Works Director. Recommended dates: Introduction December 11, 2017, Public Hearing and Second Reading January 8, 2018. Page 45

Memorandum 17-143 from Public Works Superintendent as backup Page 47

C. **Ordinance 17-44,** An Ordinance of the City Council of Homer, Alaska, Amending the 2018 Operating Budget by Authorizing the Expenditure of $61,600 from the Homer Accelerated Water and Sewer Program Fund (HAWSP) for Oversizing Water Main Along Nelson Avenue and Ronda Street. City Manager/Public Works Director. Recommended dates: Introduction December 11, 2017, Public Hearing and Second Reading January 8, 2018. Page 51

Memorandum 17-144 from Public Works Director as backup Page 53

D. **Resolution 17-097**, A Resolution of the City Council of Homer, Alaska, Confirming the City Manager's Appointment of Rick Abboud as Acting City Manager for Calendar Year 2018. City Manager. Recommend adoption. Page 57

7. VISITORS

A. South Peninsula Behavioral Health Services – Jay Bechtol, Director (10 minutes)

B. Legislative Update and Health Care Costs - Representative Paul Seaton (10 minutes) Page 61

C. Importance of General Operating Support - HANDs (Homer Area Nonprofit Directors) (10 minutes)

8. ANNOUNCEMENTS/PRESENTATIONS/BOROUGH REPORT/COMMISSION REPORTS (10 minute limit per report)

A. Borough Report

B. Commissions/Board Reports:

1. Library Advisory Board

2. Homer Advisory Planning Commission

3. Economic Development Advisory Commission

4. Parks Art Recreation and Culture Advisory Commission
   a. Memo from PARCAC Re: Budget Recommendations and request for a worksession on the HERC building Page 101

5. Port and Harbor Advisory Commission

6. Cannabis Advisory Commission

9. PUBLIC HEARING(S)

A. **Ordinance 17-42,** An Ordinance of the City Council of Homer, Alaska, Appropriating Funds for the Calendar Year 2018 for the General Fund, The Water Fund, the Sewer Fund, the Port/Harbor Fund, Capital Projects, and Internal Service Funds. City Manager. Introduction October 30, 2017, Public Hearings November 27, 2017 and December 11, 2017, Second Reading December 11, 2017. Page 109

B. **Resolution 17-086,** A Resolution of the City Council of Homer, Alaska, Amending the City of Homer Fee Schedule Under Camping Fees. City Clerk. (To follow Budget Ordinance 17-42; Public Hearings November 27 and December 11, 2017) Page 141

10. ORDINANCE(S)

11. CITY MANAGER'S REPORT

A. City Manager's Report Page 147

B. Bid Report Page 157

12. CITY ATTORNEY REPORT

13. COMMITTEE REPORT

A. Employee Committee Report
   a. Memorandum re: Employee Compensation Page 163

14. PENDING BUSINESS

15. NEW BUSINESS

16. RESOLUTIONS

17. COMMENTS OF THE AUDIENCE

18. COMMENTS OF THE CITY ATTORNEY

19. COMMENTS OF THE CITY CLERK

20. COMMENTS OF THE CITY MANAGER

21. COMMENTS OF THE MAYOR

22. COMMENTS OF THE CITY COUNCIL

23. ADJOURNMENT

Next Regular Meeting is Monday, January 8, 2018 at 6:00 p.m., Worksession at 4:00 p.m. and Committee of the Whole 5:00 p.m. All meetings scheduled to be held in the City Hall Cowles Council Chambers located at 491 E. Pioneer Avenue, Homer, Alaska.

MAYORAL PROCLAMATIONS AND RECOGNITIONS

CITY OF HOMER
HOMER, ALASKA

MAYORAL RECOGNITION
of

HOMER HIGH SCHOOL STUDENTS
CHARLIE MENKE, DOUGLAS DEAN, TUCKER WESTON, AND PHINNY WESTON

WHEREAS, Homer High School athletes are fortunate to have the opportunity to travel and compete against other high schools throughout the state; and

WHEREAS, The Mariner Hockey Team was in Anchorage the first weekend of November and after two games on Friday, November 3rd the team bus stopped at Fred Meyer so the team could get some food; and

WHEREAS, Charlie Menke, Douglas Dean, Tucker Weston and Phinny Weston opted for something different and headed to Qdoba; and

WHEREAS, Along the way noticed a trail of blood and then encountered an inebriated man who was on the sidewalk and bleeding significantly; and

WHEREAS, After talking briefly to the man the students acted on instinct and went with him into the restaurant where they helped him with his injuries using napkins and a medical kit from the restaurant, called 911, and contacted their coaches; and

WHEREAS, The students stayed with and assisted the injured man until paramedics arrived and took over the situation.

NOW, THEREFORE, I, Donna Aderhold, Mayor Pro Tempore, of the City of Homer, Alaska, do hereby recognize Charlie Menke, Douglas Dean, Tucker Weston, and Phinny Weston for their quick thinking, good instinct, and overarching compassion toward a man in need, where on a cold dark winter night, many others would have simply passed him by.

CITY OF HOMER

_____
DONNA ADERHOLD, MAYOR PRO TEMPORE

ATTEST:

_____
MELISSA JACOBSEN, MMC, CITY CLERK

PUBLIC COMMENTS
UPON MATTERS
ALREADY ON THE AGENDA

RECONSIDERATION

CONSENT AGENDA

Session 17-26 a Regular Meeting of the Homer City Council was called to order on November 27, 2017 at 6:00 p.m. by Mayor Pro Tempore Aderhold at the City Hall Cowles Council Chambers located at 491 E. Pioneer Avenue, Homer, Alaska, and opened with the Pledge of Allegiance.

PRESENT: COUNCILMEMBERS: ADERHOLD, ERICKSON, LORD, SMITH, STROOZAS, VENUTI

STAFF: CITY MANAGER KOESTER
CITY CLERK JACOBSEN
HARBORMASTER HAWKINS
FINANCE DIRECTOR WALTON
PERSONNEL DIRECTOR BROWNING
HARBORMASTER HAWKINS

Council met for a Worksession at 4:00 p.m. to discuss the Police Station Conceptual Design and Committee of the Whole 5:00 p.m. to discuss consent agenda and regular meeting agenda items in Homer City Hall Cowles Council Chambers.

Department Heads may be called upon from time to time to participate via teleconference.

Mayor Pro Tem Aderhold asked for a motion to allow Mayor Zak to participate telephonically.

STROOZAS/LORD SO MOVED

There was no discussion.

VOTE: NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

AGENDA APPROVAL

(Addition of items to or removing items from the agenda will be by unanimous consent of the Council. HCC 2.08.040.)

The following changes were made: **MAYORAL PROCLAMATIONS AND RECOGNITIONS** Mayoral Recognition of Robert Letson, CEO, South Peninsula Hospital **PUBLIC HEARINGS** Ordinance 17-42, An Ordinance of the City Council of Homer, Alaska, Appropriating Funds for the Calendar Year 2018 for the General Fund, The Water Fund, the Sewer Fund, the Port/Harbor Fund, Capital Projects, and Internal Service Funds. Written Public Comments. **CITY MANAGER'S REPORT** Councilmember Stroozas AML Report.

Mayor Pro Tem Aderhold asked for a motion to approve the agenda as amended.

LORD/VENUTI SO MOVED

There was no discussion.

VOTE: NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

MAYORAL PROCLAMATIONS AND RECOGNITIONS

A. Mayoral Proclamation Chamber of Commerce Light up Homer for the Holidays December 1, 2017

Councilmember Stroozas read and presented the proclamation to Jan Knutson of the Homer Chamber of Commerce. Ms. Knutson recapped the events for December 1st.

B. Mayoral Recognition of the Rotary Health Fair

Councilmember Lord read and presented the recognition to Beth Trowbridge. Mrs. Trowbridge commented that it's the unique partnership between Homer-Kachemak Bay Rotary and South Peninsula Hospital that allow them to do such a great job. There were over 69 exhibitors, over 1000 people attended, and over 900 blood draws. It's an amazing service to the community.

C. Mayoral Recognition of Robert Letson, CEO, South Peninsula Hospital

Councilmember Venuti read and presented the recognition to Robert Letson. Mr. Letson recognized the managers and staff at the Hospital, and the Board of Directors for their support. He acknowledged the Mayor and Council and the City's good partnership with the hospital. He also appreciates the citizen's support when bond issues were before them for needed expansions and renovations.

D. Mayoral Recognition of Todd Cook, Operator of the Year

Mayor Pro Tem Aderhold recognized Todd Cook, Water/Wastewater Treatment Superintendent who was awarded Wastewater Operator of the Year by Alaska Rural Water Association for communities with a population 1,000. Mr. Cook said this is an easy award to win when you work with good people. He has the support of his boss, the people who work for him and our crew is the best in the state.

E. Mayoral Recognition City of Homer Award from DEC for Water Source Protection

Mayor Pro Tem Aderhold recognized the City of Homer for their award for Source Water System of the Year for a population over 1,000. Deputy City Planner Engebretsen recognized the

Planning Commissioners who have put so much work into legislation over time and the residents who choose to invest and make their homes in the watershed in a safe and clean manner for everyone.

PUBLIC COMMENTS UPON MATTERS ALREADY ON THE AGENDA

Janie Leask, city resident, commented in support of a joint worksession between the City Council and the Parks Art Recreation and Culture Advisory Commission to consider the HERC, as well as a facilitated public forum on the future of the HERC. She advocated for a community recreation center at the site.

RECONSIDERATION

CONSENT AGENDA

(Items listed below will be enacted by one motion. If separate discussion is desired on an item, that item may be removed from the Consent Agenda and placed on the Regular Meeting Agenda at the request of a Councilmember.)

City Clerk Jacobsen read the Consent Agenda and recommendations into the record.

A. Homer City Council unapproved Regular Meeting Minutes of October 30, 2017 City Clerk. Recommend adoption.

B. **Memorandum 17-139** from Mayor Re: Appointment of Sara Woltjen to the Cannabis Advisory Commission. Recommend approval.

C. **Memorandum 17-140** from City Clerk Re: New Liquor License for Wild Honey Bistro and Liquor License Transfer for Oaken Keg. Recommend approval.

A. **Resolution 17-093,** A Resolution of the City Council of Homer, Alaska, Approving a New One-Year Contract with Premera Blue Cross, Sun Life Health, and Prudential. City Manager/Personnel Director. Recommend adoption.

B. **Resolution 17-094,** A Resolution of the City Council of Homer, Alaska, Establishing the 2018 Regular Meeting Schedule for the City Council, Economic Development Advisory Commission, Library Advisory Board, Parks Art Recreation and Culture Advisory Commission, Advisory Planning Commission, Port and Harbor Advisory Commission, and Cannabis Advisory Commission. City Clerk. Recommend adoption.

D. **Resolution 17-096,** A Resolution of the Homer City Council Accepting the 2016 Comprehensive Annual Financial Report with Audit and Financial Statements and Acknowledging the Management Letter Submitted by the City's Independent Auditor, BDO, USA, LLP and Authorizing the City Manager to Execute the Financial Report. City Manager/Finance Director. Recommend adoption.

Memorandum 17-142 from Finance Director as backup

Mayor Pro Tem Aderhold asked for a motion to approve the recommendations of the consent agenda as read.

ERICKSON/LORD SO MOVED

There was no discussion.

VOTE: NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

VISITORS

A. Pratt Museum Update – Laurie Stuart, Executive Director (10 minutes)

Laurie Stewart, Pratt Museum Executive Director, provided an annual update on the Pratt Museum. She commented about ongoing community events related to their 50th anniversary in Spring 2018. She reported the museum has put their new building campaign on hold until conditions are more conducive for such a large project. In the short term they will renovate the existing building to better meet the museum needs over the next ten years.

B. Homer Soil & Water Conservation District, Invasive Weeds - Matt Steffy, Natural Resources Specialist (10 minutes)

Matt Steffy, Natural Resources Specialist, commented to the Council regarding the Invasive Plant Cost Share Program, an opportunity for private land owners across the Kenai Peninsula Borough, including the City of Homer, to participate in and help identify and mitigate invasive weeds in our area.

C. Homer Chamber of Commerce Budget – Debbie Speakman, Executive Director (10 minutes)

Debbie Speakman, Homer Chamber of Commerce Executive Director, updated Council on their outreach, volunteer efforts, and their movement toward social media and web based marketing. The commercial for the Marine Trades and Homer Harbor was played and Kate Mitchell of the Marine Trades Association addressed the Association's efforts in promoting and supporting marine trades in Homer.

ANNOUNCEMENTS/PRESENTATIONS/BOROUGH REPORT/COMMISSION REPORTS
(10 minute limit per report)

Mayor Pro Tem Aderhold recognized a request for the Employee Committee to comment prior to the budget discussion.

LORD/STROOZAS MOVED TO ALLOW THE EMPLOYEE COMMITTEE TO PRESENT UNDER ANNOUNCEMENTS, PRESENTATIONS, AND COMMISSION REPORTS.

There was no discussion.

VOTE: NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

1. Library Advisory Board

Mark Massion, Library Advisory Board Member, reported the Board discussed how the Library, working in conjunction with the Council, could develop guidelines allowing donors to specify where their cash or legacy gifts will be implemented. They also discussed ways to build relationships with other Kenai Peninsula Library Boards in an attempt to share information, challenges and successes, and also to survey and find their willingness to pursue Borough support of the library services. They would like to add a September meeting to their meeting schedule. Lastly he commented in support of funding for library circulation materials.

2. Homer Advisory Planning Commission

Dale Banks, Planning Commissioner, updated the Council on the Commission's work including approving a CUP for a 72 room hotel on the Sterling Highway, a Kachemak Bay Critical Habitat sign at the base of the Spit, and a revised Barnett South Slope Quiet Creek Plat. He reported that he and Commissioner Bernard attended the Planning Commissioner Training in Anchorage recently and found it beneficial training and networking with other Commissioners from around the State.

3. Economic Development Advisory Commission

4. Parks Art Recreation and Culture Advisory Commission
   a. Memorandum Re: Lot 3 Land Acquisition North of Jack Gist Park

Matt Steffy, Park Art Recreation and Culture Advisory Commission Chair, commented on the memo provided regarding the purchase of a lot adjacent to Jack Gist Park. The Commission recommends waiting to purchase the property until the price is no more than 10% above the Borough assessment. He reported the Commission continues their work in a proposed rubric for assessing sidewalk priority developments.

5. Port and Harbor Advisory Commission

6. Cannabis Advisory Commission

7. Employee Committee
   a. Memorandum from Employee Committee Re: Health Insurance Renewal and COLA

Deputy Harbormaster Matt Clark and Deputy City Planner Julie Engebretsen reviewed their memo and highlighted the Committee recommendation that the Council consider passing Resolution 17-093 approving the renewal of the Premera, Sun Life, and Prudential Insurance Policies; and adopt the Mayor's proposed budget amendment recommending a 1% COLA increase for City Employees.

PUBLIC HEARING(S)

A. **Ordinance 17-42,** An Ordinance of the City Council of Homer, Alaska, Appropriating Funds for the Calendar Year 2018 for the General Fund, The Water Fund, the Sewer Fund, the Port/Harbor Fund, Capital Projects, and Internal Service Funds. City Manager. Introduction October 30, 2017, Public Hearings November 27, 2017 and December 11, 2017, Second Reading December 11, 2017.

Larry Slone, city resident, commented in support of the proposed budget amendments for the 1% Cost of Living Allowance for employees, reducing the employee health insurance reserve fund by $1 million and transferring it to other funds, and also maintaining the library funds.

Karin Marks, city resident, commented in support of funding for the Pratt Museum and the importance of actual art and artifacts for people to see and observe.

Jane Little, city resident, commented in support of funding for the library and Pratt Museum and their importance to the community.

Joanne Lofgren, Vice President of the Live Action Role Playing Group (LARP), commented in support of the library, noting the benefits and learning opportunities it allows for the group.

Mike Illg, city resident and city employee, commented in support of the 1% Cost of Living Allowance for employees and recognized the efforts the city employees make to provide quality service to the public.

Lila Ryterski, commented in support of funding for the library and shared her positive experience with the library staff when she was writing and publishing a book.

David Schauble, city resident, commented regarding the purchase of a drone and encouraged public discussion of pros and cons before purchasing the drone. He also commented in support of an annual Cost of Living Allowance for city employees as wages that don't keep pace with inflation are in fact annual pay cuts.

There were no further public comments and Mayor Pro Tem Aderhold opened the floor to consideration of the budget amendments included in the laydown packet.

LORD/VENUTI MOVED TO INCLUDE PROPOSED BUDGET AMENDMENT FOR THE FINANCE DEPARTMENT REQUESTED BY THE CITY MANAGER.

There was brief comment recognizing the need for full staffing and qualified personnel.

VOTE: NON OBJECTION: UNANIMOUS CONSENT.

Motion carried.

SMITH/ERICKSON MOVED TO MOVE $1 MILLION FROM ACCOUNT 600 AND TRANSFER $669,212 TO ACCOUNT #156-0376; $171,429 TO ACCOUNT #456-0380; $88,424 TO ACCOUNT #256-0378, AND $70,936 TO ACCOUNT #256-0379.

Councilmember Erickson asked if the allocation to the port and harbor reserves could be toward the purchase of lot 42.

Councilmember Smith there is funding available as outlined in Ordinance 17-41.

Councilmember Lord supports this but thinks it's important to have conversation to further understand what our comfort levels are with these various reserve accounts in future budgets.

VOTE: NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

ERICKSON/LORD MOVED TO AMEND $33,415.70 FROM THE WATER RESERVES TO PAY STEWARDSHIP COSTS FOR PRESERVING OVER 300 ACRES OF BRIDGE CREEK WATERSHED.

Mayor Pro Tem Aderhold disclosed she is on the Board of Directors for the Kachemak Heritage Land Trust.

After brief discussion no motion was offered regarding a conflict of interest or that Mayor Pro Tem Aderhold be excused from participating.

Councilmember Stroozas asked how the dollar amount was established. Mayor Pro Tem Aderhold explained there is a formula to establish the stewardship costs for the Land Trust to be able to monitor the property in perpetuity.

Councilmember Erickson added that a citizen is donating the land and wants to preserve our watershed. This is the City's part in ensuring that would happen, and she thinks it's a very reasonable cost for over 300 acres.

VOTE: NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

LORD/VENUTI MOVED TO INCLUDE THE $90,000 SALARY INCREASE FOR THE 1% COLA FOR EMPLOYEES.

Councilmember Smith commented that we fully appreciate what the employees do and the recognitions they receive are well deserving, but doesn't he doesn't agree with the concept of a COLA. It was developed for fixed benefits for social security to keep pace with inflation. The employees are paid on a scale and they get raises. Many got a 2% to 8% increase this year and he thinks that's more than adequate to keep pace with inflation. The increase in health care costs to employees isn't significant enough for him to believe that it justifies a COLA. He sees inadequacies of a COLA in that the people at the lower end of the wage scale get the least benefit, when they probably need it most. Those at the top end get more and they are probably the ones receiving a far better living wage. He'd be willing to entertain and increase for those at the top of the scale who no longer receive step increases and have been stagnant for a number of years. In his mind, the COLA was never meant to compensate people in the workforce that have the ability to get step increases, raises, or to work overtime. He's worked for a company over 20 years where a COLA is in his contract and he's gotten it once. He doesn't know if we should entertain anything on a scheduled basis because ultimately we can only afford what we can afford. He noted the ballot measure the voters passed for HART and the $660,000 that will be gained and moved to the road maintenance. The budget increase is about $250,000 this year and adding this $90,000 eats up about half of that $660,000. He wants employees to be compensated, but we have to manage the growth and the way we spend it. He noted Anchorage's $20 million budget deficit and we can look at what's going on around

the state because of building unsustainable budgets. We need to make decisions that look down the road and at the reality of what's going on. If we don't do that we fail our citizenry.

Councilmember Lord appreciates the concerns, and while the budget has gone up this year, it's gone up a fairly small amount and the City Manager has provided a balanced budget. She also appreciates the inequity of the 1% across the wage scale, but countered that we need to have a wage scale that is growing to some degree. She has worked in the private sector and received cost of living increases whenever possible. The Employee Committee has done a lot of work to save money in the ever increasing insurance costs and that's valuable. Our budget is what it is in part because of personnel cuts, which puts more work on city employees having to fill those roles. That can be seen at the state level as well. When you try to balance the budget on the back of the employees it's a losing proposition that isn't going to work in the long run. She doesn't want to look at the long term budget and do it at the expense of the morale and compensation of the city employees because that's how our roads get plowed, water gets to our taps, and how our harbor functions; it's by the people who are making it work.

Councilmember Erickson commented the budget will be impacted next year by the loss of the HART funds and it's important to consider next year because we'll have to look to not funding reserves to balance the budget. It's important to be careful what we set as a precedent going forward. She struggled with COLA last year but it was a one-time thing and wouldn't have to consider it this year, also they were trying to get some other things in place like funding for the police station. There are some big expenditures we are looking at and there are issues at the state level with pay roll tax, gas, and other things. Everyone is trying to get our dollars. We need to be careful as guardians of the city that we aren't putting our citizens at risk to have to pay more taxes to be able to get the things we need. She appreciates everything the employees are doing, she doesn't know this will give them what they need and she would appreciate if the employees would be willing to work with Council as they try to get you the tools they need to do their jobs; one of those things being a good police station to take care of the issues in our town. We also need a new vac truck and that's a lot of money. We have to look at the give and take.

Councilmember Smith noted Councilmember Lord's comments that we are over tasked so maybe the $90,000 should be used to hire another jail officer or the other maintenance worker we need at public works. We just need to be prudent right now and manage growth.

Councilmember Stroozas acknowledged the concerns expressed and suggested a compromise.

STROOZAS/LORD MOVED TO CHANGE 1% TO ONE HALF OF A PERCENT

Councilmember Lord commented in looking at the COLA in the salary and benefits survey the feedback is the idea of more consistent lower COLA's help keep us at pace rather than falling behind. It makes sense to her. She appreciates the concerns expressed and she'd rather see

the employees get a small increase rather than no increase, they haven't been getting them consistently. We need to keep employee morale at a good level and keep people wanting to come and work here. We can rely on our awesome view, harbor, and amenities, but we can only do that so much.

Councilmember Venuti commented she is hearing what the employees are saying and thinks the compromise shows Council are listening and also being prudent with the budget.

Mayor Zak commented he believes 1% is reasonable because we haven't been giving consistent increases over the years. He doesn't agree that we have to do what the state is doing. When he looks at the budget, the money is there and while he understands not everything is financially driven for the employees, he thinks it's reasonable and fair to give the 1%. It breaks down to less than .2% over the last six years and over that time the budget has grown. He thinks the Employee Committee has done well and we should appreciate they aren't asking for more.

Councilmember Stroozas reiterated this is a time of compromise and when we can do that everyone comes away with something they want. The Council has to be as fiscally responsible with our community funds as possible, and be mindful of the employees who provide the services.

VOTE (amendment): YES: ADERHOLD, LORD, VENUTI, STROOZAS, SMITH, ERICKSON

Motion carried.

There was no further discussion on the main motion as amended.

VOTE (main motion as amended): YES: VENUTI, ADERHOLD, LORD, STROOZAS, ERICKSON
NO: SMITH

Motion carried.

ERICKSON/VENUTI MOVED TO AMEND $750 FROM PARK RESERVES TO POST THREE SIGNS AT POINTS OF ENTRY INTO KACHEMAK BAY TO WARN RECREATIONAL USERS OF THE HAZARDS OF COLD WATER AND LIMITS OF EMERGENCY RESPONSE CAPABILITIES.

There was brief discussion as to sign location, design, and the need.

VENUTI/ERICKSON MOVED TO AMEND THAT THIS WILL GO THROUGH THE PARKS ART RECREATION AND CULTURE COMMISSION FOR DESIGN.

Councilmember Venuti commented regarding the importance of effective wording for the signage.

VOTE (amendment): NON OBJECTION: UNANIMOUS CONSENT

There was no further discussion.

VOTE (main motion as amended): NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

LORD/VENUTI MOVED TO INCREASE THE LIBRARY BOOK BUDGET BY $10,000 DECREASING THE TRANSFER TO THE LIBRARY RESERVES BY THE SAME AMOUNT.

There were comments in support of the budget amendment.

VOTE: NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

B. **Resolution 17-086,** A Resolution of the City Council of Homer, Alaska, Amending the City of Homer Fee Schedule Under Camping Fees. City Clerk. (To follow Budget Ordinance 17-42; Public Hearings November 27 and December 11, 2017)

Resolution 17-086(S) A Resolution of the City Council of Homer, Alaska, Approving the 2018 Fee Schedule at Current Rates. City Clerk. (To follow Budget Ordinance 17-42; Public Hearings November 27 and December 11, 2017)

Mayor Pro Tem Aderhold opened the public hearing. There were no public comments.

Mayor Pro Tem Aderhold asked for a motion to substitute Resolution 17-086(S) for Resolution 17-086.

LORD/VENUTI MOVED TO SUBSTITUTE RESOLUTION 17-086(S)

Councilmember Erickson commented that we don't charge for water and sewer on the spit and part of the issue with need a new vacuum truck is because things get dumped down there. There are costs involved with the services we're providing. She doesn't have a problem raising the camping fees, costs are going up all around. They aren't higher than any of the other campgrounds that are for hire. She supports the increase to help cover cost at least on the waste dump station.

Councilmember Stroozas commented they charge $25 a day at the Elks and they only have electric hookups and the city could charge the same.

City Manager Koester noted the city campgrounds don't have electric hookups.

Councilmember Lord noted earlier comments that this is the third year in a row we've increased rates but there hasn't been any change in service associated with the rise in rates.

There was brief discussion of the services available on the spit, the dump stations, water, dumpsters, and bathrooms. The cost to maintain the facilities goes up.

City Manager Koester commented there has been a decline in occupancy and the camp grounds have not been full for all the major holidays when we are always full. We've seen an increase in revenue because of the rate increases. The employees who collect the fees are the ones dealing with the customers who are angry about the continual increases over the last few years, and they were unable to participate at the PARCAC meeting.

Councilmember Lord said it's important to know they aren't filling those slots, especially on the major holidays.

VOTE (substitute): YES: ADERHOLD, VENUTI
NO: LORD, ERICKSON, STROOZAS, SMITH

Motion to substitute failed so Resolution 17-086 stands and will come back on December 11th.

C. **Ordinance 17-39,** An Ordinance of the City Council of Homer, Alaska, Accepting and Appropriating a Grant from the Alaska Highway Safety Office in the Amount of $39,488 for the Homer Police Department Project Drive and Authorizing the City Manager to Execute the Appropriate Documents. City Manager/Police Chief. Introduction October 30, 2017, Public Hearings November 27, 2017 and December 11, 2017, Second Reading December 11, 2017.

Memorandum 17-132 from Police Chief as backup

Mayor Pro Tem Aderhold opened the public hearing. There were no public comments.

Mayor Pro Tem Aderhold asked for a motion for the adoption of Ordinance 17-39 by reading of title only for second and final reading.

ERICKSON/VENUTI SO MOVED

There was no discussion.

VOTE: NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

D. **Ordinance 17-40,** An Ordinance of the City Council of Homer, Alaska, Amending Homer City Code Title 3 Chapter 3.01 Budget by Adding a New Section That Establishes a Minimum Annual Transfer in the Operating Budget of Homer Accelerated Road and Trails Funds for Road and Trail Capital Improvements. Smith/Aderhold. Introduction October 30, 2017, Public Hearing and Second Reading November 27, 2017.

Memorandum 17-133 from City Manager as backup

Mayor Pro Tem Aderhold opened the public hearing.

Deb Lowney, city resident, expressed her concern that the ordinance and resolution establish a minimum amount to be transferred in and used, but not a maximum amount. The maintenance list is extensive and could consume the HART funds. She would like the language to use percentages of the fund that can be spent.

There were no further public comments.

Mayor Pro Tem Aderhold asked for a motion for the adoption of Ordinance 17-40 by reading of title only for second and final reading.

LORD/VENUTI SO MOVED

LORD/ERICKSON MOVED TO AMEND LINE 47 FOLLOWING CODE TO INCLUDE SHALL BECOME EFFECTIVE ON JANUARY 1, 2019.

There was no discussion.

VOTE (amendment): NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

Councilmember Smith commented the intent is the amount of money taken out of HART for maintenance is on an annual basis. He felt using a percentage would be more complicated than using a number that has been established over time. This amount won't deplete the fund over time and will give the flexibility to do a capital project when we need to.

VOTE (main motion as amended): NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

E. **Resolution 17-092,** A Resolution of the City Council of Homer, Alaska, Amending the Homer Accelerated Roads and Trails Program (HART) Policy Manual to the HART Capital

Improvements Policy Manual and Establishing Minimum Set Asides for Capital Improvements. Smith/Aderhold

Memorandum 17-133 from City Manager as backup

Mayor Pro Tem Aderhold opened the public hearing. There were no public comments.

Mayor Pro Tem Aderhold asked for a motion for the adoption of Resolution 17-092 by reading of title only.

ERICKSON/LORD SO MOVED

LORD/ERICKSON MOVED TO AMEND LINE 57 BE IT FURTHER RESOLVED THESE CHANGES SHALL BECOME EFFECTIVE JANUARY 1, 2019.

There was no discussion.

VOTE (amendment): NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

There was brief comment regarding a typographical error that would be corrected using reviser authority.

VOTE (main motion as amended): NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

F. **Ordinance 17-41,** An Ordinance of the City Council of Homer, Alaska, Authorizing the City Manager to Purchase Kenai Peninsula Borough Parcel 18103418, 'Lot 42' from the Alaska Mental Health Trust Authority in the Amount of $550,600, Acquire Quitclaim Deeds on Parcels on which both the City and the Trust Claim Ownership interests and Authorizing an Expenditure of $250,600 from the Port and Harbor Enterprise Fund and a $300,000 Loan from the General Fund for that Purpose. City Manager. Introduction October 30, 2017, Public Hearing and Second Reading November 27, 2017.

Ordinance 17-41(S) An Ordinance of the City Council of Homer, Alaska, Authorizing the City Manager to Purchase Kenai Peninsula Borough Parcel 18103418, 'Lot 42' from the Alaska Mental Health Trust Authority in the Amount of $550,600, Acquire Quitclaim Deeds on Parcels on which both the City and the Trust Claim Ownership interests and Authorizing an Expenditure of ~~$250,600~~ **$550,600** from the Port ~~and Harbor Enterprise Fund and a $300,000 Loan from the General Fund~~ for that Purpose. Erickson.

Ordinance 17-41(S) An Ordinance of the City Council of Homer, Alaska, Authorizing the City Manager to Purchase Kenai Peninsula Borough Parcel 18103418, 'Lot 42' from the Alaska Mental Health Trust Authority in the Amount of $550,600, Acquire Quitclaim Deeds on Parcels on which both the City and the Trust Claim Ownership interests and Authorizing an Expenditure of $250,600 from the Port and Harbor Enterprise Fund and a $300,000 Loan from the General Fund for that Purpose. Mayor.

Memorandum 17-134 from City Manager as backup
Memorandum 17-141 from City Manager as backup

Mayor Pro Tem Aderhold opened the public hearing. There were no public comments.

Mayor Pro Tem Aderhold asked for a motion for the adoption of Ordinance 17-41 by reading of title only for second and final reading.

ERICKSON/VENUTI SO MOVED

Mayor Pro Tem Aderhold asked for a motion to substitute Ordinance 17-41(S) presented by Councilmember Erickson.

No motion was brought forward to substitute.

Mayor Pro Tem Aderhold asked for a motion to substitute Ordinance 17-41(S) presented by Mayor Zak.

STROOZAS/VENUTI SO MOVED

There was brief discussion that the amendments in this substitute may plant some seeds with the Mental Health Trust Authority and doesn't impact the outcome of the purchase of lot 42.

VOTE (substitute): YES: VENUTI, LORD, STROOZAS
NO: ERICKSON, ADERHOLD, SMITH

Mayor Zak voted yes to break the tie.

Motion carried.

Councilmember Lord noted that it would be beneficial to be able to confirm there aren't addition properties with similar circumstances so this won't happen in the future.

City Manager Koester referenced an email with the Trust who, in legalese, said to their knowledge they don't own additional properties in conflict. She will work with the City Attorney to consider that when dealing with the purchase agreement.

VOTE (main motion): YES: STROOZAS, ERICKSON, SMITH, LORD, VENUTI, ADERHOLD

Motion carried.

ORDINANCE(S)

CITY MANAGER'S REPORT

A. City Manager's Report

City Manager Koester commented regarding application for a Code Blue Grant for a battery powered chest compressor. It's something the ambulance can carry and improve patient care, and the grant requires a $3,200 match.

There was brief discussion of drone operations and question was raised about contracting with someone who's in compliance with FAA in cases of emergency for search and rescue instead of purchasing a drone. City Manager Koester will follow up.

There was also discussion of the Cannabis Advisory Commission membership relating to Councilmember seats. Mayor Pro Tem Aderhold suggested an ordinance amendment could be proposed if councilmembers think it should be changed.

Lastly, Council discussed public use of the sand pile at Public Works and agreed that public use should no longer be allowed due to liability issues.

B. Bid Report

CITY ATTORNEY REPORT

COMMITTEE REPORT

A. Employee Committee Report
   a. Memorandum from Employee Committee Re: Health Insurance Renewal and COLA

Heard under Commission Reports item 7.

B. Americans with Disabilities Act Compliance Committee

Mayor Pro Tem Aderhold commented the Committee has completed their surveys and will be working on input the data into a format that can be incorporated into the Transition Plan.

PENDING BUSINESS

NEW BUSINESS

RESOLUTIONS

A. **Resolution 17-095,** A Resolution of the Homer City Council Approving an Amendment to the Icicle Seafood's, Inc. Lease for Lot 41 to Include Lot 42 Homer Spit Subdivision Amended, Which Expires December 31, 2036 with a Base Rent of $69,648 Subject to Appraisal and Authorizing the City Manager to Execute the Appropriate Documents. City Manager.

Memorandum 17-141 from City Manager as backup

Mayor Pro Tem Aderhold asked for a motion for the adoption of Resolution 17-085 by reading of title only.

ERICKSON/VENUTI SO MOVED.

There was no discussion.

VOTE: NON OBJECTION: UNANIMOUS CONSENT

Motion carried.

COMMENTS OF THE AUDIENCE

Larry Slone, city resident, said he's sorry to see the public access to the sand go away but he understands the decision with liability and abuse. He concurs with the statements made about the quality of city employees and shared his positive dealings with planning staff, clerk's office staff, and public works. There are always two sides to an issue and if we don't present both sides, we aren't doing a good job for the public. He appreciates the discussion tonight.

Deb Lowney, city resident, welcomed Rachel and Caroline to the Council. She thanked Councilmember Stroozas and City Manager Koester for their time at Lunch with a Councilmember at the Library today. PARCAC would like to have a worksession with Council in reference looking the hurdles we face with the HERC and its future for this community and follow up with a community forum. She appreciated the discussion on cold water safety and thinks it's good for the discussion on signage to take place at PARCAC.

Todd Cook, non-resident and city employee, commented it was encouraging to have some compromise in the discussion of employee benefits tonight. He doesn't always agree with what

the Employee Committee comes up with, but as they look at things to bring to council they are already considering the compromises. They try to balance it on their end so as not to be unreasonable. He explained the situation when he was hired and touched on changes that have taken place in his tenure. He encouraged Council to look at ways to increase revenue rather than continually making cuts.

Julie Engebretsen, non-resident and city employee, thanked Council for their consideration and compromise on the COLA. She understands these are never easy decisions. The message she will take back to the Employee Committee is while COLA's are part of the metric of the city staying competitive, are there other areas to look at in the future.

Matt Clarke, Employee Committee Chair, commented we conducted the Salary and Benefit Survey to see where we are at compared to other municipalities and government entities in our region. The common thing they all do is implement COLA's and we're 5% behind the other 12 entities in the average they created over the last 6 years. The Consumer Price Index in Anchorage is the only benchmark we have for a measure of inflation in the Southcentral region. Our moorage rates use the Anchorage CPI on an annual basis for adjustment and increase.

Nick Poolos, non-resident and city employee, echoed Todd Cook's comments. He had job offers in Anchorage, Homer, and Sitka. The pay in Homer was slightly lower but the benefits package is what brought him here, but it has drastically changed since then. He encouraged council to be concerned about turnover and recruitment.

COMMENTS OF THE CITY ATTORNEY

City Attorney Wells was not present.

COMMENTS OF THE CITY CLERK

City Clerk Jacobsen had no comment.

COMMENTS OF THE CITY MANAGER

City Manager Koester had no comment.

COMMENTS OF THE MAYOR

Mayor Zak told Mayor Pro Tem Aderhold she did an excellent job running the meeting tonight. He hopes the Councilmembers who voted to compromise on the employee COLA will take it back to 1% because the employees and the committee did to a lot of due diligence to come to council with a fair amount for the COLA. That and the public comment would justify bringing it back up. He hopes everyone had a good Thanksgiving.

COMMENTS OF THE CITY COUNCIL

Councilmember Venuti had no comment.

Councilmember Smith commented he attended the last Great Alaska Shootout, there was some good basketball and has gone on for many years. They had their 16th annual Turkey Bowl with no injuries reported. It's a great time to be thankful. He's thankful to be part of the community and City Council.

Councilmember Lord commented she attended the Newly Elected Officials Training at AML and it was really educational and interesting. She thinks it's valuable to send representatives from the City. Ms. Lord said she appreciates everyone's comments tonight. She will be at the library in December for Lunch with a Councilmember and invited people to attend.

Councilmember Erickson commented she recently visited Arizona for a conference where there were freeways and all the building had the same color schemes. She expressed her appreciation for the individuality we have here in Homer. She also reminded people to use caution these dark mornings around the school busses and bus stops. Some of the stops are not in the safest spots, so keep an eye out for the kids.

Councilmember Stroozas commented he attended and enjoyed the AML sessions in Anchorage. He noted Alaska is on the verge of a great opportunity in the agreement with China in regard to the Alaska gas line development project and that it will bring jobs to the peninsula. Good things are happening.

Mayor Pro Tem Aderhold thanked everyone for helping her through the meeting tonight.

ADJOURN

There being no further business to come before the Council Mayor Pro Tem Aderhold adjourned the meeting at 9:53 p.m. The next Regular Meeting is Monday, December 11, 2017 at 6:00 p.m., and Committee of the Whole at 5:00 p.m. All meetings scheduled to be held in the City Hall Cowles Council Chambers located at 491 E. Pioneer Avenue, Homer, Alaska.

_____

MELISSA JACOBSEN, MMC, CITY CLERK

Date:_____

ORDINANCE REFERENCE SHEET
2017 ORDINANCE
ORDINANCE 17-43

Ordinance 17-43, An Ordinance of the City Council of Homer, Alaska, Amending the Official Road Maintenance Map of the City of Homer by Adding Ternview Place and Little Fireweed Lane.

Sponsor: City Manager/Public Works Director

1. Council Regular Meeting December 11, 2017 Introduction

    a. Memorandum 17-143 from Public Works Superintendent as backup

CITY OF HOMER
HOMER, ALASKA

City Manager/
Public Works Director

ORDINANCE 17-43

AN ORDINANCE OF THE CITY COUNCIL OF HOMER, ALASKA AMENDING THE OFFICIAL ROAD MAINTENANCE MAP OF THE CITY OF HOMER BY ADDING TERNVIEW PLACE AND LITTLE FIREWEED LANE AS URBAN ROAD.

WHEREAS, The City of Homer has determined that it is necessary to provide minimum standards to regulate design and construction of public streets, roads, and highways within the City of Homer; and

WHEREAS, Ordinance 85-14, HCC 11.04.055, adopted July 2, 1985 provides appropriate street design and construction standards as well as an official maintenance map to record streets officially accepted for maintenance; and

WHEREAS, HCC 11.04.055 provides that the City shall not accept maintenance responsibility for any road or street which is not constructed or reconstructed to the adopted standards unless the road is shown on the Official Road Maintenance Map. As amended via Ordinance 02-23(S), adopted June 10, 2002, of the City of Homer; and

WHEREAS, An additional 1780 lineal feet has been duly inspected, reviewed, approved by the Department of Public Works and recommended for acceptance by the City of Homer as Urban Road.

NOW THEREFORE, The City of Homer Ordains:

Section 1: Section 11.04.055 Official Road Maintenance Map adopted is hereby amended per provisions of sections (a) through (e) to include the following additional streets as Urban Road by the City of Homer and recorded as amendments #40 and 41 on the New Official Road Maintenance Map adopted: the following mileage calculation is to the nearest hundredth.

Amend	Subdivision	Roadway Name	Lineal Feet	Mile	Class
40.	Commercial Park Unit 1	Ternview Place	480	.09	Urban
41.	Commercial Park Unit 1	Little Fireweed Lane	1300	.25	Urban

Section 2: This is a non code ordinance and of a permanent nature.

ENACTED BY THE CITY COUNCIL OF HOMER, ALASKA, this 8th day of January, 2018.

CITY OF HOMER

_____
DONNA ADERHOLD, MAYOR PRO TEMPORE

ATTEST:

_____
MELISSA JACOBSEN, MMC, CITY CLERK

YES:
NO:
ABSTAIN:
ABSENT:

First Reading:
Public Hearing:
Second Reading:
Effective Date:

Reviewed and approved as to form:

_____	_____
Mary K. Koester, City Manager	Holly Wells, City Attorney
Date:_____	Date:_____

City of Homer
Dan Gardner, Superintendent

Public Works
3575 Heath Street
Homer, AK 99603
dgardner@ci.homer.ak.us
(p) 907-235-3170
(f) 907-235-3145

MEMORANDUM 17-143

To: Melissa Jacobsen, City Clerk

Through: Carey S. Meyer, PW Director
From: Dan Gardner, PW Superintendent

Date: November 29, 2017

Subject: Street Improvements – Official Road Maintenance Map
Little Fireweed Lane & Ternview Place

As part of a Subdivision Agreement, road improvements have been constructed for the Commercial Park Unit 1 Subdivision. These road improvements were finished in 2017 and this department has inspected and approved the construction.

The two streets are:

1. Ternview Place - 480 lineal feet
2. Little Fireweed Lane - 1300 lineal feet

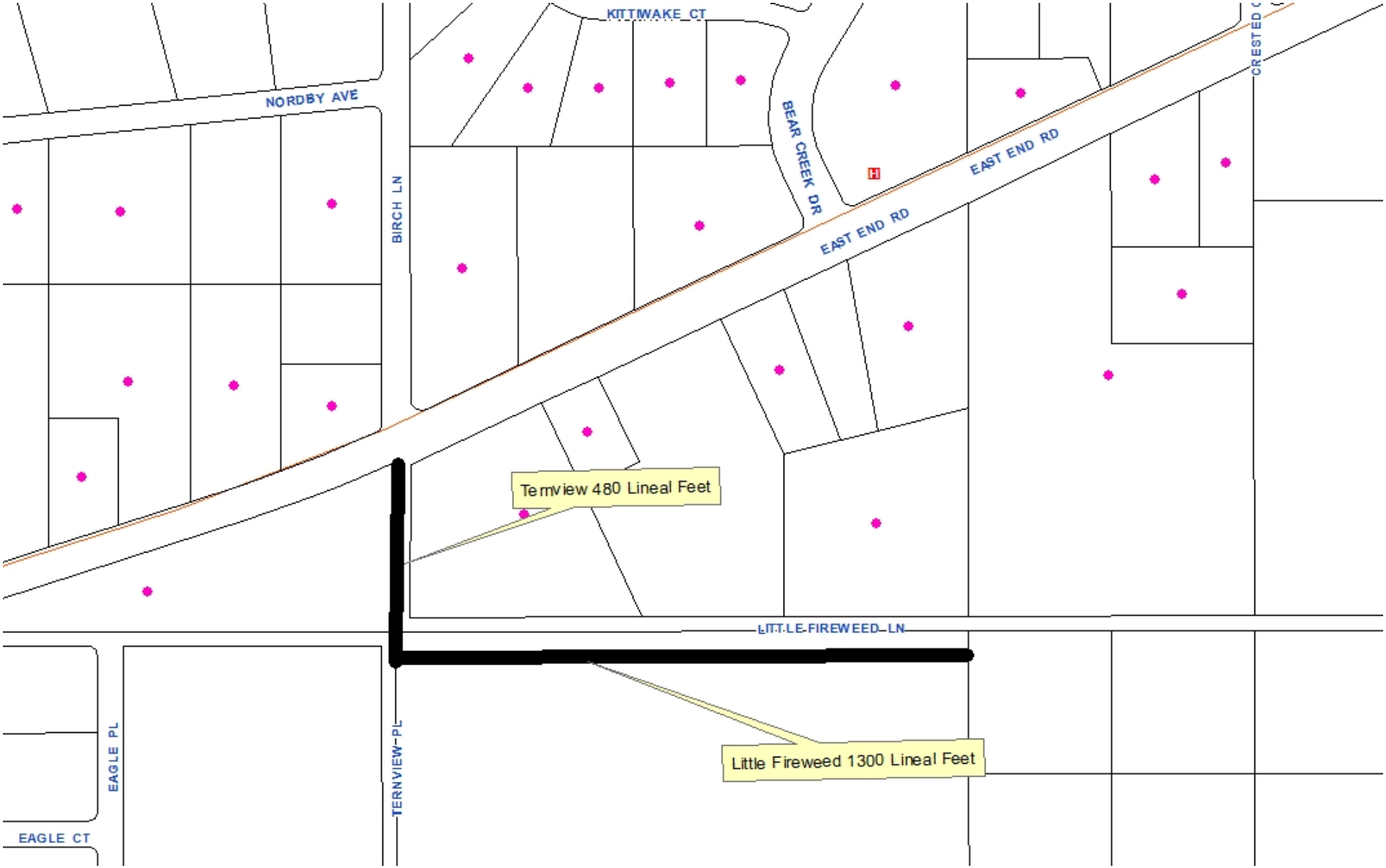
This is a total of 1780 lineal feet (.34 miles)

In accordance with Ordinance 85-13, Section 12.20.090, and Section 11.20.100, this Department requests that the City Council formally accept the street improvements for operation and maintenance. Upon the Council's approval, please add the additional .34 miles of road to the Official City Road Maintenance Map for year-round maintenance.

See attached map for location.

Fiscal Note – Annual maintenance costs for these improvements is estimated to be $6300.

C: Carey Meyer, PW Director
Katie Koester, City Manager


KITTIWAKE CT
NORDBY AVE
BIRCH LN
BEAR CREEK DR
EAST END RD
EAST END RD
CRESTED
Ternview 480 Lineal Feet
LITTLE FIREWEED LN
Little Fireweed 1300 Lineal Feet
TERNVIEW PL
EAGLE PL
EAGLE CT

ORDINANCE REFERENCE SHEET
2017 ORDINANCE
ORDINANCE 17-44

Ordinance 17-44, An Ordinance of the City Council of Homer, Alaska, Amending the 2018 Operating Budget by Authorizing the Expenditure of $61,600 from the Homer Accelerated Water and Sewer Program Fund (HAWSP) for Oversizing Water Mail Along Nelson Avenue and Ronda Street.

Sponsor: City Manager/Public Works Director

1. Council Regular Meeting December 11, 2017 Introduction

    a. Memorandum 17-144 from Public Works Director as backup

CITY OF HOMER
HOMER, ALASKA

City Manager/
Public Works Director

ORDINANCE 17-44

AN ORDINANCE OF THE CITY COUNCIL OF HOMER, ALASKA, AMENDING THE 2018 OPERATING BUDGET BY AUTHORIZING THE EXPENDITURE OF $61,600 FROM THE HOMER ACCELERATED WATER AND SEWER PROJECT FUND (HAWSP) FOR OVERSIZING WATER MAIN ALONG NELSON AVENUE RONDA STREET.

WHEREAS, The Developer of the Quiet Creek Subdivision is preparing to construct the required road, drainage, water, sewer, and non-City owned utilities in support of the development. Public Works has reviewed the plans; and

WHEREAS, The water main from the Owen Court/Nelson Avenue intersection to East End Road needs to be larger than the 8"main required for this subdivision to allow water from a future tank above the subdivision to serve areas below; and

WHEREAS, Developers are required to install 8" mains; the City pays the cost of pipe material only to oversize mains if larger pipes are needed to serve the entire community. The cost of oversizing the pipe is estimated to be $61,600; and

WHEREAS, Water system infrastructure improvement costs have traditionally been funded by the HAWSP fund.

NOW, THEREFORE, THE CITY OF HOMER ORDAINS:

Section 1. The FY 2018 Operating Budget is hereby amended by appropriating $61,600 from the Homer Accelerated Water and Sewer Project Fund for the purposes of oversizing the water main in the Quiet Creek Subdivision.

Account	Description	Amount
HAWSP Fund	Quiet Creek Subdivision Water Main Oversizing	$61,600

Section 2. This is a budget amendment ordinance, is not permanent in nature, and shall not be codified.

ENACTED BY THE CITY COUNCIL OF HOMER, ALASKA, this 8th day of January, 2018.

CITY OF HOMER

_____
DONNA ADERHOLD, MAYOR PRO TEMPORE

ATTEST:

_____
MELISSA JACOBSEN, MMC, CITY CLERK

YES:
NO:
ABSTAIN:
ABSENT:

First Reading:
Public Hearing:
Second Reading:
Effective Date:

Reviewed and approved as to form:

_____ _____
Mary K. Koester, City Manager Holly Wells, City Attorney

Date: _____ Date: _____

City of Homer
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(f) 907-235-3145

M E M O R A N D U M 17-144

TO: Mary K. Koester, City Manager

FROM: Carey Meyer, Public Works Director

DATE: December 6, 2017

SUBJECT: **Proposed Quiet Creek Park Subdivision**
Need for City Funds to Oversize Water Main

Echo Trading Company LLC has initiated planning and design of the Quiet Creek Subdivision. Attached is a vicinity map showing the project location. As part of the approval process, Public Works has prepared a Construction Agreement that binds the Developer to the conditions under which construction of all required road, drainage, water, sewer, and non-City owned utilities will be completed. The final plat is being reviewed by the KPB with recommendations from the Homer Advisory Planning Commission. Public Works is currently reviewing and commenting on construction plans for the required improvements. Construction of Phase I is anticipated in 2018.

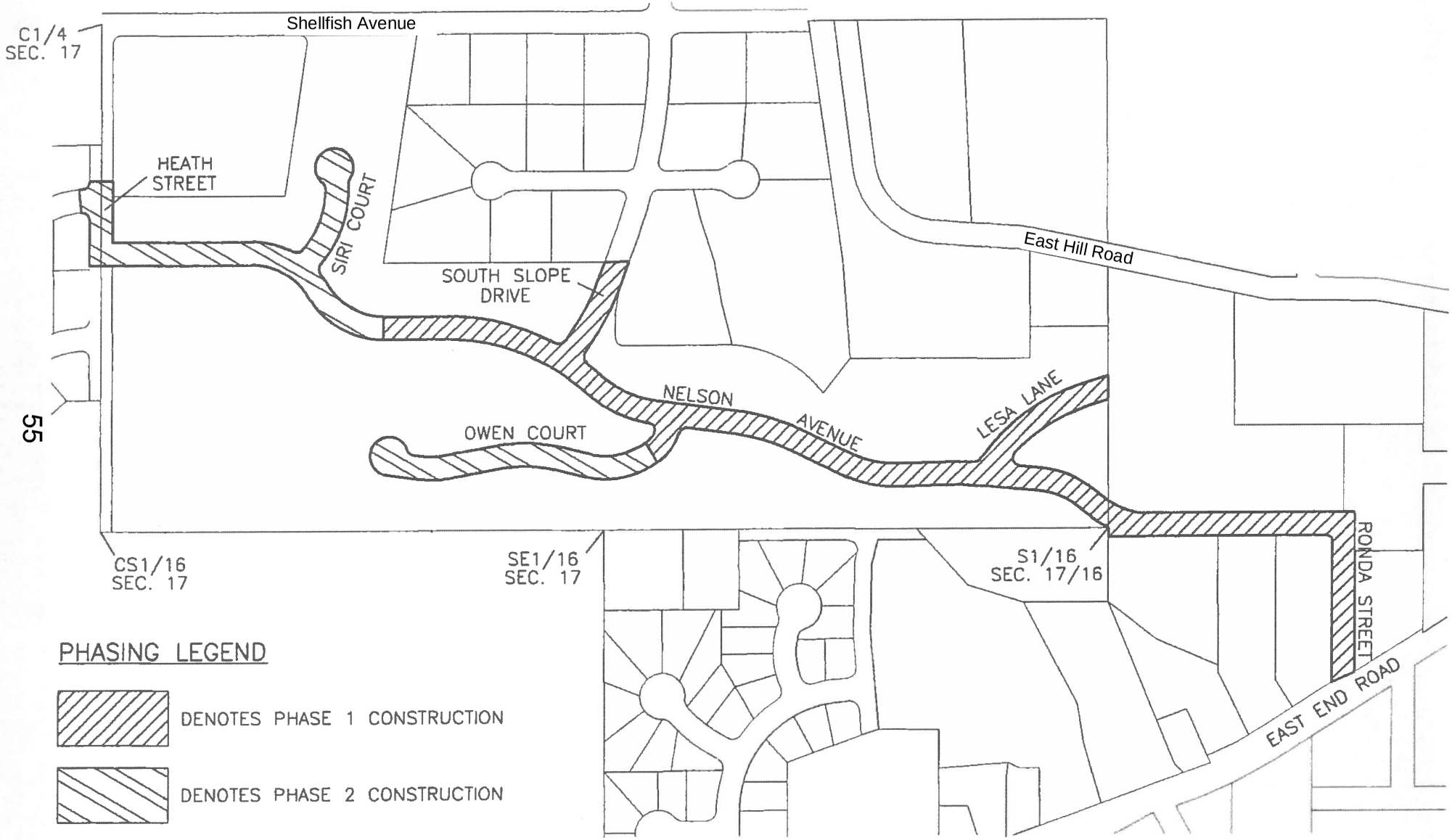
In reviewing the plans for any subdivision, Public Works looks at the area as a whole to determine what impacts its development will have on the community and what improvements are needed to support the interests of the community. One facet of the review focuses on the water and sewer systems. The Water/Sewer Master Plan provides information regarding the sizes of mains needed as the City grows. The water main from the Owen Court/Nelson Avenue intersection to East End Road needs to be larger than the 8”main required for this subdivision (to allow water from a future tank above the subdivision to serve areas below). Attached is an oversizing map showing the location of this main. Developers are required to install 8” mains; the City pays to oversize mains if larger pipes are needed to serve the entire community (limited to cost of oversized pipe material only). Below is an estimate of the costs associated with oversizing:

Pipe material oversizing cost (8” to 12”) 2250 LF = 2800 x $22/LF = $61,600

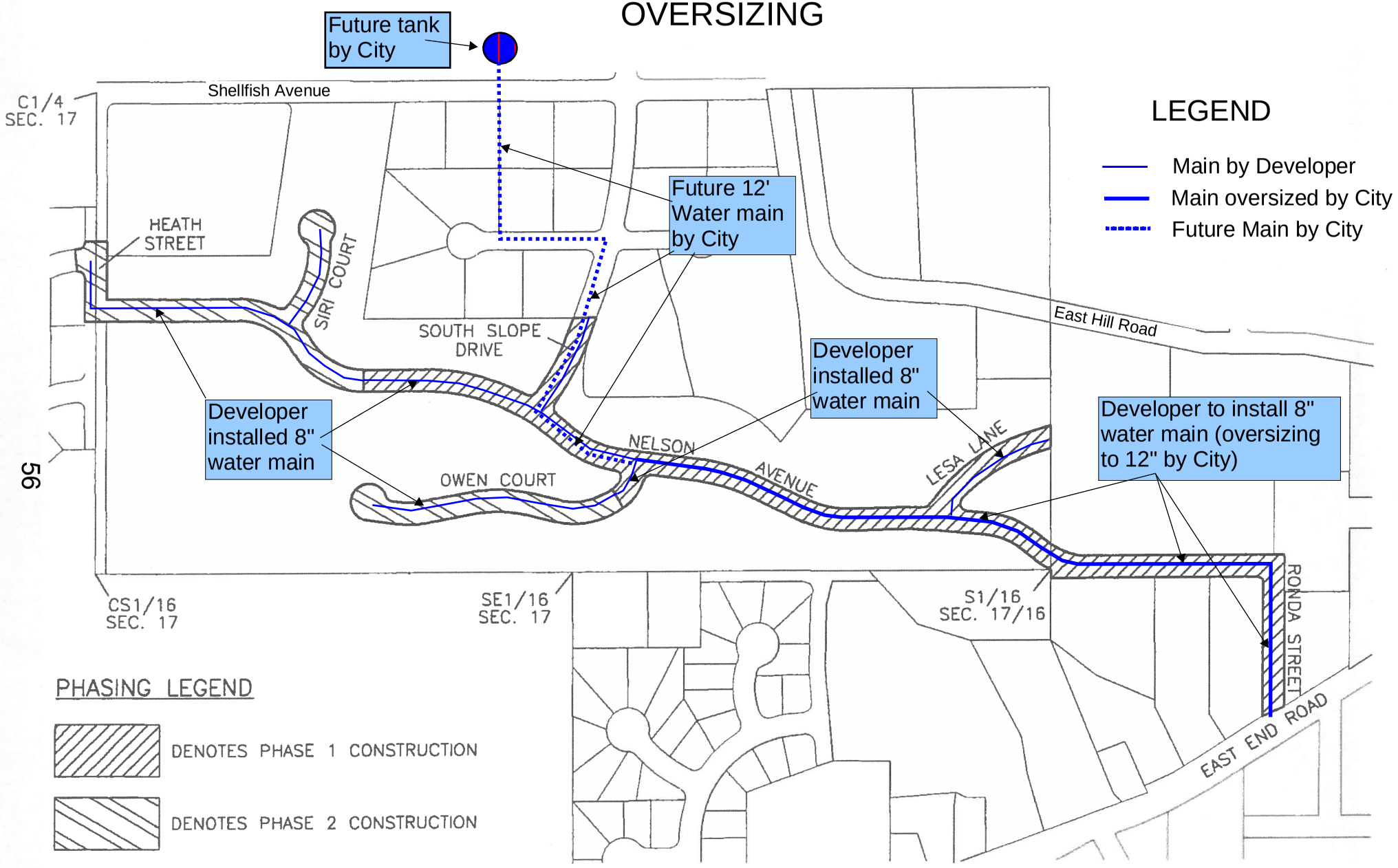
These kinds of water infrastructure improvement costs have traditionally been funded by the HAWSP fund. Resolution 16-074 placed a moratorium on the use of the HAWSP funds for completing Special Assessment Districts, but has not limited its continued use in funding these relatively small miscellaneous improvement needs. The Planning Commission has worked on guidelines for how to prioritize and select new Special Assessment District projects that need to be discussed with Council when time allows.

Recommendation: The City Council should pass an ordinance authorize the expenditure of $61,600 for the required oversizing of water mains within the Quiet Creek Subdivision from the HAWSP fund.

QUIET CREEK SUBDIVISION - HOMER, ALASKA
SITE MAP



QUIET CREEK SUBDIVISION - HOMER, ALASKA
OVERSIZING



CITY OF HOMER
HOMER, ALASKA

City Manager

RESOLUTION 17-097

A RESOLUTION OF THE HOMER CITY COUNCIL CONFIRMING THE CITY MANAGER'S APPOINTMENT OF RICK ABBOUD AS THE ACTING CITY MANAGER FOR CALENDAR YEAR 2018.

WHEREAS, Homer City Code 1.20.010(b) states that the City Manager shall annually appoint an Acting City Manager, subject to the City Council confirmation which is revocable at any time, by the Council; and

WHEREAS, Pursuant to Homer City Code Section 1.20.010(b) the Acting City Manager shall assume the duties and powers of the City Manager in their absence.

NOW, THEREFORE, BE IT RESOLVED by the Homer City Council that Rick Abboud is hereby appointed by City Manager Katie Koester and confirmed by the Homer City Council as Acting City Manager for the Calendar Year 2018.

PASSED AND ADOPTED by the City Council of Homer, Alaska, this 11th day of December, 2017.

CITY OF HOMER

_____
BRYAN ZAK, MAYOR

ATTEST:

_____
MELISSA JACOBSEN, MMC, CITY CLERK

Fiscal Note: N/A

VISITORS

PLOS ONE

RESEARCH ARTICLE

Vitamin D supplementation to palliative cancer patients shows positive effects on pain and infections—Results from a matched case-control study

Maria Helde-Frankling[1,2], Jonas Höijer[3], Jenny Bergqvist[4,5], Linda Björkhem-Bergman[1,2]*

1 ASIH Stockholm Södra, Långbro Park, Palliative Home Care and Hospice Ward, Älvsjö, Sweden, **2** Department of Laboratory Medicine, Division of Clinical Microbiology, Karolinska Institutet and Karolinska University Hospital, Huddinge, Stockholm, Sweden, **3** Unit of Biostatistics, Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden, **4** Department of Surgery, Breast Centre, Capio St Gorans Hospital, Stockholm, Sweden, **5** Department of Oncology-Pathology, Karolinska Institutet, Stockholm, Sweden

* linda.bjorkhem-bergman@ki.se

Citation: Helde-Frankling M, Höijer J, Bergqvist J, Björkhem-Bergman L (2017) Vitamin D supplementation to palliative cancer patients shows positive effects on pain and infections—Results from a matched case-control study. PLoS ONE 12(8): e0184208. https://doi.org/10.1371/journal.pone.0184208

Editor: Moray Campbell, Roswell Park Cancer Institute, UNITED STATES

Received: January 30, 2017

Accepted: August 21, 2017

Published: August 31, 2017

Data Availability Statement: The raw data is available in the Supporting Information file. However, in accordance with the approved applications to the Regional Ethical Review Board we have removed the age and some other personal data of the included subjects from the dataset to make it impossible to identify single patients.

Funding: Financial support was provided through the Regional agreement on training and clinical research (ALF) between Karolinska Institutet and

Abstract

Background

We previously showed an association between low vitamin D levels and high opioid doses to alleviate pain in palliative cancer patients. The aim of this case-controlled study was to investigate if vitamin D supplementation could improve pain management, quality of life (QoL) and decrease infections in palliative cancer patients.

Methods

Thirty-nine palliative cancer patients with levels of 25-hydroxyvitamin D < 75 nmol/L were supplemented with vitamin D 4000 IE/day, and were compared to 39 untreated, matched ªcontrolº-patients from a previous study at the same ward. Opioid doses, antibiotic consumption and QoL-scores measured with the Edmonton Symptom Assessment Scale (ESAS) were monitored. The primary endpoint was the change from baseline after 1 and 3 months compared between the groups using linear regression with adjustment for a potential cofounding factor.

Results

After 1 month the vitamin D treated group had a significantly decreased fentanyl dose compared to the untreated group with a difference of 46 μg/h; 95% CI 24±78, which increased further at 3 months to 91 μg/h; 95% CI 56±140 μg/h. The ESAS QoL-score improved in the Vitamin D group the first month; -1.4; 95% CI -2.6 - (-0.21). The vitamin D-treated group had significantly lower consumption of antibiotics after 3 months compared to the untreated group, the difference was -26%; 95%CI -0.41%±(-0.12%). Vitamin D was well tolerated by all patients and no adverse events were reported.

Stockholm County Council, The Swedish Cancer Society and Karolinska Institutet.

Competing interests: The authors have declared that no competing interests exist.

Conclusion

Vitamin D supplementation to palliative cancer patients is safe and improvement in pain management is noted as early as 1 month after treatment. Decreased infections are noted 3 months after vitamin D treatment. The results from this pilot-study have been used for the power-calculation of a future randomized, placebo-controlled, double-blind study called [a]Palliative-D[o] that will start in Nov 2017 and will include 254 palliative cancer patients.

Introduction

Palliative cancer patients often suffer from pain and infections, which may reduce their quality of life and shorten their remaining life span. In palliative medicine, good symptom management and prevention of new symptoms are major priorities, aiming to maintain or even improve the patient's quality of life. Since pharmacological treatment often has unwanted side effects, the palliative caregiver faces the challenge of treating disease related symptoms without causing harm.

Vitamin D is synthesized in the skin using energy from UVB-light. Vitamin D is further hydroxylated in two steps into the active form 1,25-dihydroxyvitamin D, which binds to the vitamin D receptor (VDR). The activated VDR complex regulates a large number of genes [1] and vitamin D is important for a healthy immune system since it induces the synthesis of antimicrobial peptides in immune cells and on mucosal surfaces as a part of the [a]first line defense[o] against invading microbes [2].

The pro-form 25-hydroxyvitamin D (25-OHD) is more stable than the active 1,25 hydroxyvitamin D, with a half-life of about 3 weeks compared to 4 hours [3] which is why it is used for evaluation of vitamin D status [4]. Serum levels of 25-OHD below 50 nmol/L are considered to be insufficient according to the Institute of Medicine in the US [5]. Furthermore, there is increasing evidence that levels of 25-OHD above 75 nmol/L are optimal for the immune system [6,7].

Low serum levels of vitamin D are more common in palliative cancer patients than in healthy controls [8±10]. Both observational and interventional studies suggest a role of vitamin D in pain intensity and in management of pain in varying clinical settings [8,11±16]. Nevertheless, 3 meta-analyses reviewing previously performed randomized, controlled trials (RCTs) could not establish a correlation between vitamin D supplementation and pain reduction [14,17,18]. In contrast, a recent review of published RCTs concluded that a significantly greater mean decrease in pain score could be observed with vitamin D supplementation compared to placebo treatment in patients with chronic pain [19]. There is also increasing evidence that vitamin D supplementation may reduce depressive symptoms and improve quality of life [20,21].

A previous prospective, observational study performed at our palliative care unit in Stockholm, studied the relationship between 25-OHD levels and opioid dose, infections and quality of life [8]. In this study, lower serum levels of 25-OHD correlated with a higher fentanyl dose. However, there was no correlation between serum 25-OHD levels and infections or quality of life. No vitamin D-supplementation was given in that study. After this study we have changed the guidelines at our ward and patients with 25-hydroxyvitamn D levels of < 75 nmol/L are now offered vitamin D supplementation. In the current study we wanted to determine if the vitamin D supplementation could improve pain management, reduce infections and improve

quality of life in our palliative cancer patients. Finally, we also wanted to evaluate if there were any negative side effects of the treatment in this patient group.

Methods

Study cohort

This is a case-control study where the vitamin D supplemented patients were followed prospectively with regards to their opioid consumption, infections and quality of life. The supplemented patients were later matched with untreated control-patients from a previous study at the same ward, performed before the new guidelines regarding vitamin D-treatment were introduced. In this study cohort, palliative cancer patients were supplemented with vitamin D 4000 IE/day (Detremin) and followed for up to 3 months.

Palliative cancer patients were recruited consecutively when they were admitted to ASIH Stockholm Södra, Långbro Park Advanced Palliative Home Care Team or Hospice Ward from Sept 2015 to June 2016. Inclusion criteria were: age 18 or above, incurable cancer (any type of cancer), expected survival time of more than 1 month and serum levels of 25-OHD < 75 nmol/L, i.e. [a]insufficient levels[o] according to local guidelines at Karolinska University Hospital Stockholm. The patients were supplemented with vitamin D3 (Detremin: cholecalciferol (vitamin D3) dissolved in Miglyoil). Patients took 8 drops of this Detremin every day; corresponding to 4000 IE = 100 μg. All patients that survived for more than 1 month were included in the final analysis.

Control group

Each treated patient was matched with an untreated control. Controls were taken from a previous observational vitamin D study at our ward (n = 169) that was started 2014. The first 100 patients included in that study are described in a previous publication [8]. In that study the same parameters as in the present study were monitored, and 25-OHD was measured, but no vitamin D treatment was given. The patients in the study cohort were matched with untreated controls regarding, sex, approximate age (±10 years), cancer type (divided into the 8 groups: breast cancer, GI-cancer, lung cancer, pancreatic cancer, prostate cancer, gynecological cancers, cholangiocarcinoma and head and neck cancer), 25-OHD level at baseline, survival time (1±3 month, 3±6 months or more than 6 months after inclusion) and number of days in the study. To the greatest possible extent, the matched treated and untreated patients had the same cancer type, but in the GI-cancer group a treated patient with small bowel cancer was matched with an untreated patient with colon cancer, and one patient in the intervention group with rectal cancer was matched with a control with esophageal cancer.

Data extraction

Patients with detected vitamin D deficiency, i.e. 25-OHD levels < 75 nmol/L according to local guidelines, were asked to participate in the study. After inclusion the demographic data regarding age, sex and type of cancer were retrieved from the patients' medical records and levels of 25-OHD, CRP and albumin at baseline were measured. The levels of 25-OHD in serum were analyzed by chemiluminescence immunoassay (CLIA) on a LIAISON-instrument (DiaSorin Inc, Stillwater, MN, USA,) with a detectable range of 7.5±175 nmol/L, CV 2±5% at the Department of Clinical Chemistry, Karolinska University Hospital. Opioid dose, infections and ESAS QoL-score were recorded at baseline, and after 1 month and 3 months (for surviving patients). After 3 months the 25-OHD levels, CRP, albumin and S-calcium were monitored again. Survival time was recorded.

Infections were defined as the percentage of days with antibiotic treatment the month before study inclusion. Opioid dose at the day of inclusion was recorded and translated to the corresponding fentanyl dose (μg/ hour). Self-assessed QoL was recorded with the Edmonton Symptom Assessment Scale (ESAS) [22], that is routinely monitored every second week in all patients at ASIH Långbro Park. Using the ESAS scale 10 different parameters are assessed, where QoL is one such parameter. The ESAS-scale ranges from 0±10, where the number 10 is the `worstpossible quality of life' and 0 represents a `goodquality of life' [22].

Data from treated individuals with a survival time of less than 3 months were matched with data from the corresponding time before death for untreated individuals, i.e. if the individual lived for 40 days after inclusion, data from the 40 last days in life of the untreated matched control were collected.

The raw data is available in S1 Table. However, in accordance with the approved applications to the Regional Ethical Review Board we have removed the age and some other personal data of the included subjects from the dataset to make it impossible to identify single patients.

Statistical analysis

Statistical analyses were performed using Stata v. 13.1. Baseline characteristics for the two groups were compared using paired t-test for continuous variables, McNemar's test for binary variables and Wilcoxon signed rank test for [a]number of days in the study[o]. CRP was log-transformed due to skewness, before conducting the paired t-test. The paired t-test was also used to compare vitamin D levels between baseline and after three months in the vitamin D group, among the 23 patients that have a measured vitamin D level at both time points.

The comparisons of the change from baseline in opioid dose, infections and quality of life between the two groups were made using crude fixed effects linear regression, where the fixed effects take the matched structure of the data into account. Due to heteroscedasticity and skewness in the outcome variables, bias corrected and accelerated bootstrap [23] were used to calculate 95% confidence intervals for the mean differences. Since there was an imbalance concerning CRP between the groups, an adjusted analysis was also made for each crude comparison, using a log-transformed version of CRP as covariate.

Ethical statement

The studies were approved by the Regional Ethical Review Board, Stockholm, Sweden; Dnr: 2015/776-31 (vitamin D treatment) and 2014/455-31/4 (controls without treatment) and was performed in accordance with the declaration of Helsinki. Written informed consent was obtained from all patients, both cases and controls, before inclusion in the studies. This consent gave us the opportunity to collect data retrospectively 3 months before inclusion and up to one year after inclusion.

Results

Demography of cases and controls

Fifty patients were included in the vitamin D treated group. Eight patients died within one month of treatment, one patient did not take the vitamin D oil and was excluded, and 2 patients were lost to follow up since they were dismissed from the Palliative Home Care Team. Thirty-nine patients, 18 men and 21 women, survived more than 1 month and were included in the final analysis and were thus matched with untreated patients from the previous study cohort [8]. Twenty-six patients survived more than 3 months and could be included in the 3 month follow up (Fig 1). The mean age was 62 years (SD 13). All patients included in the study

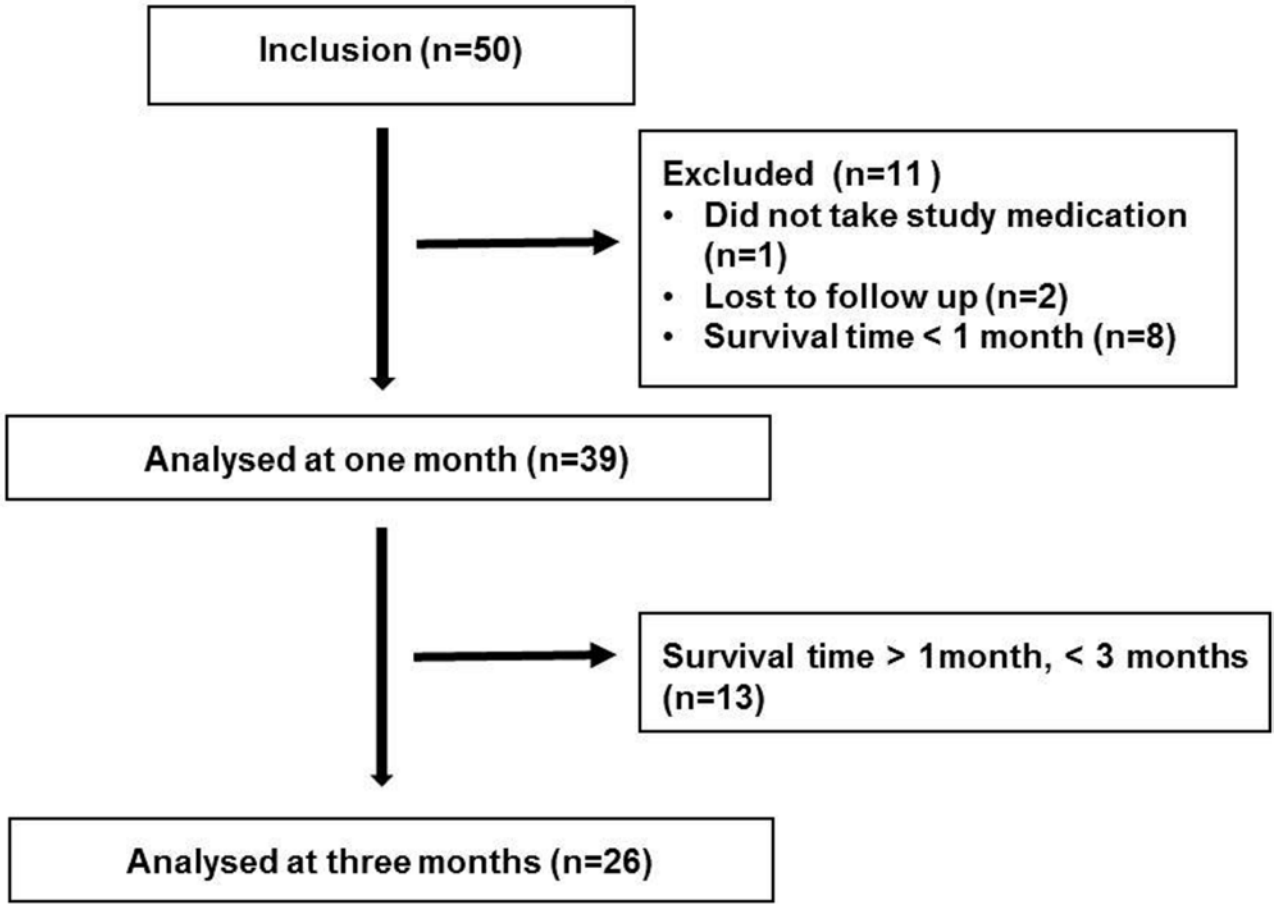


Fig 1. Flowchart of patients included in the vitamin D intervention study.

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were palliative cancer patients, and the diagnoses were breast cancer (n = 6), colorectal cancer (n = 11), lung cancer (n = 5), pancreatic cancer (n = 4), gynecological cancer (n = 3), cholangiocarcinoma (n = 2) and head and neck cancer (n = 5).

Fifty-six % of vitamin D treated and 49% of non-vitamin D treated patients were given palliative chemotherapy at baseline. Three of six patients with breast cancer in the intervention group and four of six breast cancer patients in the untreated cohort, as well as all patients with prostate cancer in both groups, were on anti-hormonal treatment at the time of inclusion.

Matching

There was no statistically significant difference between the intervention group and the untreated cohort in the baseline values except for CRP and ESAS QoL-score. The demography of all patients is shown in Table 1.

As stated in the statistical analysis section, there was an imbalance concerning CRP between the treatment group and the controls. The adjusted analysis made for each crude comparison yielded no significant difference from the unadjusted analysis, and in the following text the unadjusted data is presented. Both adjusted and unadjusted data are presented in Tables 2 and 3.

Table 1. Baseline demography of vitamin D treated patients and untreated controls. The figures show total number and percentage or mean ± SD.

Parameter	Vitamin D (n = 39)	Controls (n = 39)	p-value
Sex			
Male (n)	18 (46%)	18 (46%)	
Female (n)	21 (54%)	21 (54%)	1
Age (SD)	61,9 ± 13	62,4± 13	0.65
Type of cancer (n)			
CNS	1	1	
Breast	6	6	
Colorectal	11	11	
Lung	5	5	
Gynecological	3	3	
Pancreas	4	4	
Cholangiocarcinoma	2	2	
Head-Neck	2	2	
Prostate	5	5	
Number of days in the study (SD)	76 ± 21	76 ± 21	1
Survival > 90 days (n)	26	26	1
Vitamin D (nmol/L)	33 ± 26	38 ± 18	0.34
CRP (mg/L)	47 ± 76	67 ± 75	**0.01***
Albumin (g/L)	28 ± 6	27 ± 7	0.15
ESAS QoL (points)	5,49 ± 2,0	4,05 ± 2,4	**0.02***
Infections (days of antibiotics)	16% ± 19%	15% ± 27%	0.83
Pain (μg fentanyl/h)	31 ± 48	43 ± 5	0.20
Chemotherapy (n)	22	19	0.51

There was no statistically significant difference between treated and untreated patients except for CRP and ESAS QoL-score:
*p<0.05.

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Opioid dose

At baseline there was no statistically significant difference in opioid doses between the groups. The mean fentanyl dose in the vitamin D treated patients was 31 μg/h at inclusion (n = 39), 37μg/h after one month (n = 39) and 22 μg/h after three months (n = 26). In the control group the mean fentanyl dose increased from 43 μg/h at baseline (n = 39), to 95 μg/h after one month (n = 39), and 117 μg/h (n = 26) after three months observation time.

The change in fentanyl dose between the groups was analyzed by linear regression with bias corrected and accelerated bootstrap and revealed a statistically significant difference already

Table 2. Results from crude and adjusted analysis of change in fentanyl dose, ESAS QoL-score and infections (% days with antibiotics) compared to baseline in vitamin D treated and untreated patient after 1 month. Figures show mean value (95% CI).

		1 month (n = 39)		
Outcome		**Mean change from baseline**	**Crude mean difference in change**	**Adjusted mean difference in change**
Fentanyl	**Treated**	6 μg/h	-46 μg/h (-78 ±(-24)	-60 μg/h (-101± (-28))
	Untreated	52 μg/h		
ESAS	**Treated**	-1.1	-1.4 (-2.6 ±(-0.21))	-1.4 (-2.90 ±(-0.60))
	Untreated	0.2		
Infections	**Treated**	-6%	-9% (-20%± 2%)	-6% (-17% ±8%)
	Untreated	3%		

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Table 3. Results from crude and adjusted analysis of change in fentanyl dose, ESAS QoL-score and infections (% days with antibiotics) compared to baseline in vitamin D treated and untreated patient after 3 month. Figures show mean value (95% CI).

3 months (n = 26)				
Outcome		**Mean change from baseline**	**Crude mean difference in change (95% CI)**	**Adjusted mean difference in change (95% CI)**
Fentanyl	**Treated**	-6 μg/h	-91 μg/h (-140 ±(-56))	-120 μg/h (-185 ±(-49))
	Untreated	85 μg/h		
ESAS	**Treated**	-1.3	-1.6 (-3.1±0)	-2.0 (-4.4±0.72)
	Untreated	0.3		
Infections	**Treated**	-13%	-26% (-41%±(-12%))	-29% (-49%±(-11%))
	Untreated	13%		

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after 1 month; 46 μg/h (95% CI 24±78 μg/h), which increased even further at three months; 91 μg/h (95% CI 56±140 μg/h) (Tables 2 and 3, Fig 2A).

In the treatment group 36% of patients (n = 14) reduced their daily opioid dose during the follow up period. Out of these 14 patients 8 patients were on active palliative oncological treatment (chemotherapy and/or hormonal therapy) at the time of inclusion. In the control group we observed reduction of opioid dose in one patient over time. This patient was treated with palliative chemotherapy at baseline.

In the treatment group 28% of patients (n = 11) were not treated with opioids at baseline, and these patients remained opioid free at one month (n = 11) and at three months (n = 7). In the treatment group 18% of patients (n = 7) stopped taking opioids during the study period (fentanyl dose at baseline 12±25 μg/h). In the control group, 12 patients were not on opioids at baseline. Six patients in the control group were still opioid free after one month, and five patients were opioid free after three months.

Quality of life

At baseline there was a significant difference in the mean ESAS QoL-score between the vitamin D treated group and the controls. The mean ESAS QoL-score was 5.5 in the vitamin D group and 4.1 in the control group, i.e. the vitamin D group had lower self-assessed QoL compared to the control group. A small improvement in the ESAS QoL-score (i.e. decrease in ESAS-score) among the vitamin D treated patients was observed after one month, eliminating the difference between the two groups; -1.4 (95% CI -2.6-(-0.21) (Tables 2 and 3, Fig 2B). After three months no further significant changes in either group were seen.

Infections

One month after treatment with vitamin D there was a trend towards lower incidence of infections in the vitamin D treated group compared with the matched, untreated controls. This was due to an increased number of days on antibiotic treatment in the untreated group, and a reduction of the number of days on antibiotics in the vitamin D treated cohort. After 3 months of vitamin D supplementation a statistically significant mean difference between the groups with regards to infections could be observed, with lower values in the vitamin D treated group; -26% (95% CI -41%±(-12%)) (Tables 2 and 3, Fig 2C).

Compliance

Follow-up monitoring of 25-OHD was performed after 3 months in 23 patients and showed a mean value of 73 nmol/L (SD 31) which was a significant increase from baseline as shown in Fig 3 ($p<0.0001$). Only two patients did not have increased 25-hydroxyvitamin D levels. One

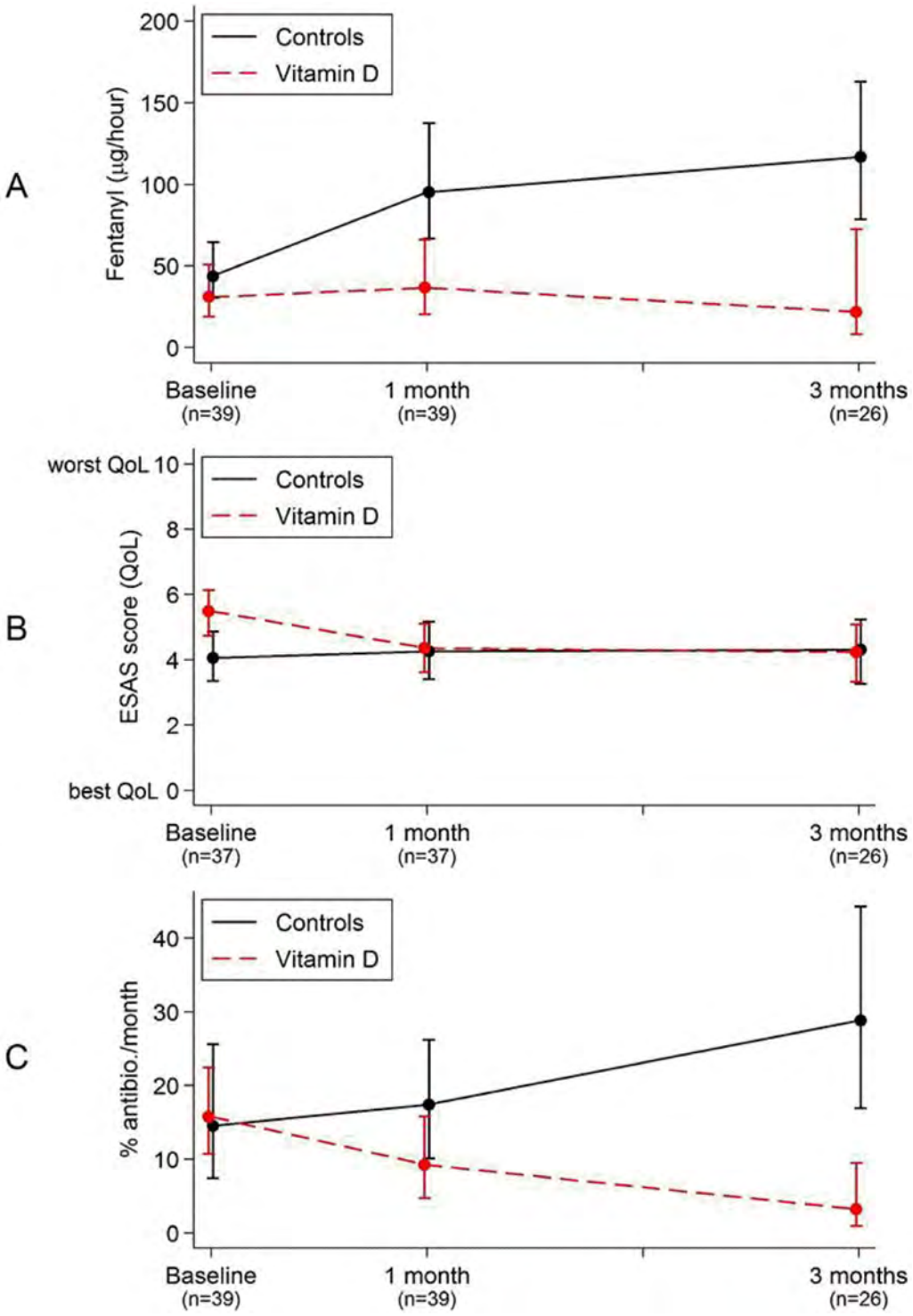

Fig 2. Differences in opioid dose (µg fentanyl/h) (A), Quality of Life (according to ESAS-assessment) (B) and antibiotic consumption (% of days with antibiotic the month before) (C) between 39 vitamin D treated palliative cancer patients and 39 matched controls. Points show mean values and bars show 95% CI. There was a significant difference in fentanyl dose between the groups as soon as 1 month after treatment and in antibiotic consumptions after 3 months.

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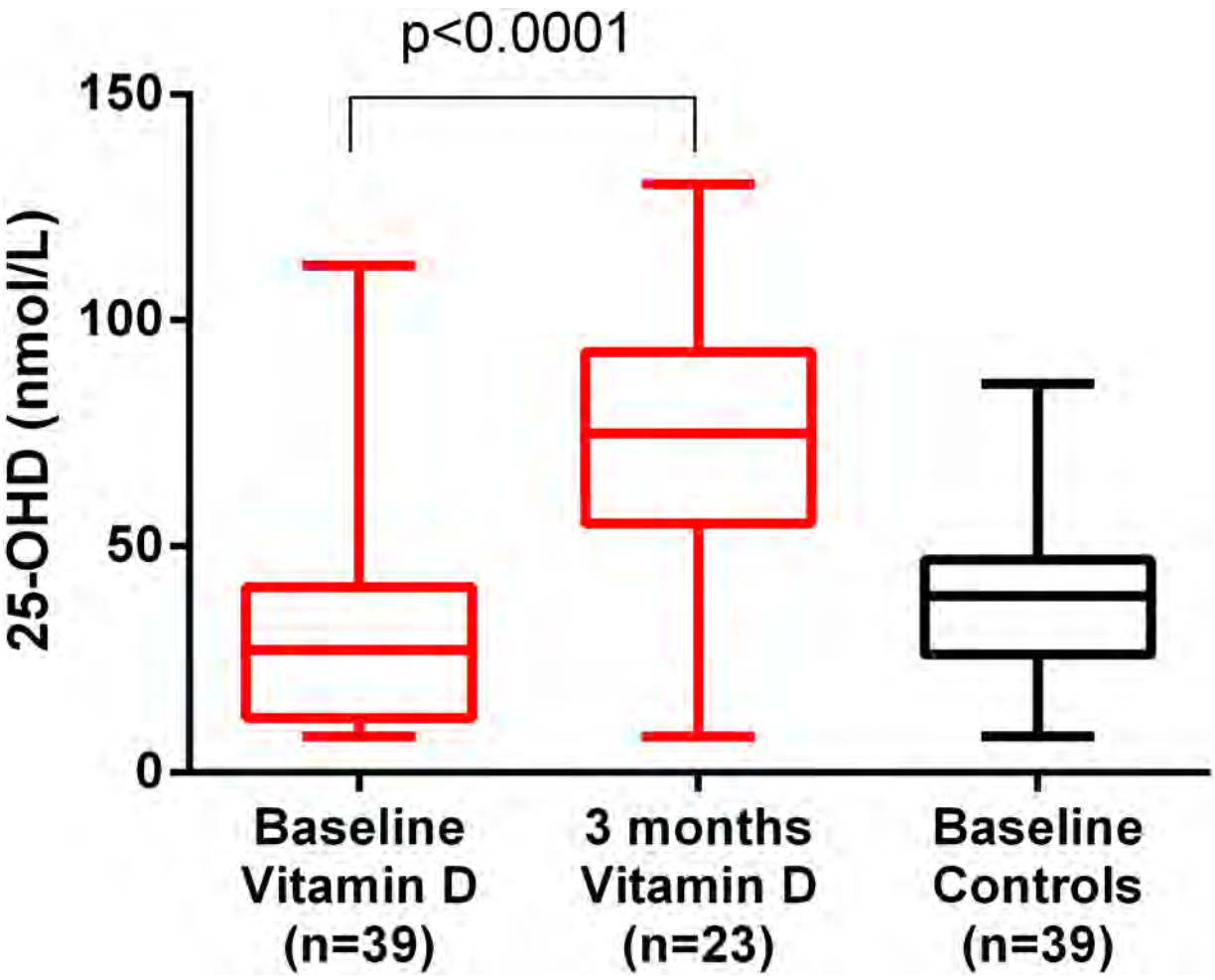

Fig 3. 25-hydroxyvitamin D (25-OHD) levels in the vitamin D (n = 39 and n = 23) and control group (n = 39). There was a significant increase of 25-OHD levels in the vitamin D group compared to baseline; statistical analysis was performed by using a paired t-test (p<0.0001). There was no statistically significant difference in baseline values between the vitamin D and control group. There were no follow-up measurements performed in the control group. The lines show median value, the boxes 25±75 percentile and whiskers show minimum and maximum.

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of these patients, a man with GI-cancer and inflammatory bowel disease, had undetectable levels (< 8 nmol/L) both at baseline, and after 1 month and 3 months. However, we perceived him as meticulous about his medication. He also asked for a new bottle after 1.5 months and wanted follow-up monitoring regarding serum levels of 25-OHD already after 1 month. He had a very short small bowel (less than 0.5 m) and as such it was likely that he did not have sufficient absorption of the vitamin D. This patient died less than 4 month after inclusion. He had a small improvement in pain-management the first month after inclusion, but no significant change in QoL or antibiotic consumption. Another vitamin D-treated patient, a woman with GI-cancer, had a decrease in serum levels of 25-OHD from 62 nmol/L to 32 nmol/L after 3 months. In her medical records, there is no information on compliance. However, a new bottle of Detremin was given to her after 2 months. She had unchanged parameters throughout the study on pain, QoL and antibiotic consumption.

The levels of 25-OHD was never measured in the control group after 3 months since these patients did not receive any treatment. Thus, only the baseline levels of 25-OHD in the control group is shown in Fig 3.

Side effects

No side effects, including hypercalcemia, were reported in the intervention group. Safety samples were collected after 3 months (for those still alive) including, 25-OHD, calcium, albumin and creatinine.

Discussion

In this study we show that vitamin D supplementation in palliative cancer patients who had 25-OHD < 75 nmol/L resulted in decreased administration of opioids already after 1 month compared to untreated control patients. In addition, there was a significant reduction in antibiotic consumption among the vitamin D treated patients after three months of supplementation. Importantly, there were no documented side effects of vitamin D supplementation in the intervention group.

To our knowledge, no results from randomized, clinical trials on vitamin D supplementation in palliative cancer patients have been published. However, the effect of 10 000 IU D-vitamin/day, in combination with calcium, in bisphosphonate treated breast cancer patients with bone metastases was investigated where each patient was its own control. In this study, vitamin D supplementation had no effect on self-reported pain intensity, but there was a significant decrease in number of pain sites over time [24]. Previous randomized, controlled trials of vitamin D treatment of non-cancer patients with chronic pain have shown divergent results [14,17±19].

When evaluating results from clinical vitamin D trials, it is important to consider baseline levels of 25-OHD [25]. If patients with sufficient vitamin D levels at baseline are included in an intervention study, they will not benefit from treatment. This is often forgotten when vitamin D studies are evaluated and compared. In the current study we have only included patients with insufficient levels of vitamin D.

An advantage of our study compared to previous studies is that we can observe the effect on opioid doses, which is a more objective marker for pain, than for example VAS-scores, which are used more frequently in pain-studies. However, we only study opioid-dependent pain, i.e. nociceptive pain, in this study and neurological pain or other types of pain, e.g. existential pain, were not studied.

The physiological mechanism linking vitamin D to pain is not yet elucidated. Evidence from both clinical and animal studies suggest that insufficient levels of vitamin D affect both peripheral [26,27] and parasympathetic nerve function [28]. Vitamin D also has anti-inflammatory effects, especially on the T-cell response [29], and this might decrease inflammatory-mediated pain. One hypothesis is that UVB-exposure increases the production of analgesic beta-endorphins, which suggest that serum levels of vitamin D could serve as a marker for UVB exposure, and would then not directly be involved in the pain mechanism [30]. However, if this was the only explanation then vitamin D treatment would not have been successful in reducing pain in our study.

In our study the opioid doses in the untreated group continued to increase over time during the observation period of up to 90 days. This is the natural scenario in palliative cancer patients, and our results are in accordance with the results from a retrospective, population based study looking at opioid use over time in palliative cancer patients during the last 11

months of life, where daily opioid doses continued to increase in all groups until the last recorded observation two weeks before death [31].

Several observational studies have reported a correlation between vitamin D deficiency and decreased QoL in different patient-populations [32±36]. In a previous observational study at our center, no correlation was seen between low 25-OHD levels and QoL in palliative cancer patients [8]. In a cross sectional study on 30 palliative cancer patients in Spain, no statistically significant association between 25-OHD and overall QoL was observed, but higher vitamin D status correlated with absence of fatigue and improved physical and functional well-being [37].

Vitamin D plays an important role in the immune system by inducing antimicrobial peptides on mucosal surfaces and in immune cells, as well as downregulating cytokines and reducing inflammation [2,29]. In a meta-analysis on 11 randomized, controlled trials vitamin D treatment was shown to reduce the number of respiratory tract infections [38]. The meta-analysis also showed that the protective effect of vitamin D was larger in studies using once-daily dosage compared to bolus doses.

No studies so far have considered the effect of vitamin D treatment on the infections in cancer patients. In palliative cancer patients, infections as well as antibiotic treatment are frequent. In a recent retrospective study at our site, 49% of patients were treated with antibiotics during the last two weeks of life [39]. The results from our present study suggest that vitamin D supplementation in patients with low serum levels of vitamin D can reduce the number of days the patients were treated with antibiotics, thus reducing the risk for negative side effects, as well as the risk of increasing the frequency of multi-resistant bacteria. Since antibiotics towards end of life in palliative cancer patients is often administered intravenously [39], reducing the number of days on antibiotic treatment can improve the individual patient's autonomy and facilitate home care.

Despite the potential effect on pain, infections and QoL, this study has several limitations which need to be considered. First, the case-control design has its inherent limitations since it is difficult to find representative control patients. In addition, the controls have been selected from a historic cohort from a previous study at the same ward. The difference in time between the collected data in the two groups might potentially have affected the results since it cannot be excluded that the prescribing pattern of opioids or antibiotics might have changed over the two year period between the studies. Although there were no large differences in baseline demography between the groups as presented in Table 1 it should be noted that the control-group had higher CRP levels at baseline, which might be a marker of a heavier cancer-burden in that group. In addition, there were 3 more patients on chemotherapy in the vitamin D group compared to the control-group, which might also have contributed to the reduction in pain. The small sample size of this study (39+39) is also a limitation. To confirm the findings presented here, larger, randomized trials are needed. In fact, the data from this study has been used for a power-calculation for a future double-blinded, randomized, controlled trial (n = 250) called°Palliative-D°, which is registered at Clinicaltrial.gov, and will start in September 2017 at our ward.

Another weakness of this study is the fact that the studied cohort is heterogeneous with regards to the type of tumor, ongoing oncological treatment and remaining life expectancy, making it difficult to control extraneous variables. However, in a narrative review discussing possible evidence-based approaches in palliative research, Aoun *et al* argue that findings from heterogeneous cohorts such as ours are in fact well generalizable in different palliative care settings because of the proximity to clinical reality [40].

Despite these limitations, the findings presented here are still hard to explain without assuming some effect of the supplement.

The absence of a large effect in QoL despite the positive results on pain and infections might be explained by the fact that the QoL depends on much more than merely opioid-

dependent pain and infections. As such these small effects that might improve the day-to-day life for these patients, without additional side-effects, must be seen as an important contribution to the treatment of palliative cancer patients. An addition benefit of the supplement is that since Detremin is an oil-based supplement (oral solution) it is easy to swallow also for patients that have difficulties in swallowing tablets.

Conclusion

Vitamin D treatment in palliative cancer patients may reduce opioid doses, reduce infections and improve QoL without causing harm to the patients. However, larger randomized, placebo-controlled studies are needed to confirm the results from this pilot-study before any form of conclusions can be drawn. Thus, the results from this pilot-study have been used for the power-calculation of a future randomized, placebo-controlled, double-blind study called [a]Palliative-D[o]. This study will start in Stockholm, Sweden, Nov 2017 and will include 254 palliative cancer patients from several different Palliative Home Care Teams. The results from Palliative-D will provide an increased possibility to evaluate the true effects and possible draw backs of vitamin D treatment in palliative cancer patients and will be used to develop new treatment guidelines.

Supporting information

S1 Table. Raw data from the case-control study.
(PDF)

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Formal analysis: MHF JH JB LBB.

Funding acquisition: LBB.

Investigation: MHF JH JB LBB.

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Project administration: MHF LBB.

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Supervision: LBB.

Validation: MHF JH JB LBB.

Visualization: MHF JH LBB.

Writing ± original draft: MHF LBB.

Writing ± review & editing: MHF JH JB LBB.

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Incidence rate of type 2 diabetes is >50% lower in GrassrootsHealth cohort with median serum 25–hydroxyvitamin D of 41 ng/ml than in NHANES cohort with median of 22 ng/ml

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ABSTRACT

Higher serum 25–hydroxyvitamin D [25(OH)D] concentrations have been associated with lower risk of type 2 diabetes. This study compared incidence rates of type 2 diabetes among participants aged ≥20 years in two U.S. cohorts with markedly different median 25(OH)D concentrations. The median 25(OH)D concentration in the GrassrootsHealth (GRH) cohort was 41 ng/ml (N = 4933) while in the 2005–6 National Health and Nutrition Examination Survey (NHANES) it was 22 ng/ml (N = 4078) ($P < 0.0001$). The adjusted annual incidence rate of type 2 diabetes was 3.7 per 1000 population (95% confidence interval = 1.9, 6.6) in the GRH cohort, compared to 9.3 per 1000 population (95% confidence interval = 6.7, 12.6) in NHANES. In the NHANES cohort, the lowest 25(OH)D tertiles (<17, 17–24 ng/ml) had higher odds of developing diabetes than the highest tertile (OR: 4.9, $P = 0.02$ and 4.8, $P = 0.01$ respectively), adjusting for covariates. Differences in demographics and methods may have limited comparability. Raising serum 25(OH)D may be a useful tool for reducing risk of diabetes in the population.

1. Introduction

According to the Centers for Disease Control (CDC), diabetes afflicts 29.1 million people in the United States, about 9.3% of the population [1]. Type 2 diabetes accounts for 90–95% of adult diabetes cases. The CDC expects the number of cases to double or triple in the next 40 years. Diabetes is the leading cause of kidney failure, non-traumatic lower limb amputations, and new cases of blindness among adults and is the seventh leading cause of death in the United States. The estimated total yearly cost of diabetes in the United States is $245 billion [1].

Those with type 2 diabetes have lower serum 25–hydroxyvitamin D [25(OH)D] concentrations than their healthy counterparts [2–4]. Prospective studies [5–16] and randomized controlled trials [17–20] have found a vitamin D association with type 2 diabetes and its metabolic indicators. A recent meta-analysis including both longitudinal cohort studies and randomized controlled trials of vitamin D supplementation found that higher baseline 25(OH)D levels in prospective studies predicted a lower diabetes risk [21]. There was a 43% reduction in type 2 diabetes incidence (95% confidence interval [CI] = 24–57%) comparing the highest (>25 ng/ml) to the lowest (<14 ng/ml) category of 25(OH)D.

We hypothesized that individuals in a cohort with higher serum 25(OH)D concentrations would have lower incidence of type 2 diabetes than those in a cohort with lower concentrations. This report presents the incidence of type 2 diabetes among United States residents aged 20 years and older in the GrassrootsHealth (GRH) study, a cohort with a median serum 25(OH)D level of 41 ng/ml, compared with estimates for the 2005–2006 National Health and Nutrition Examination Survey (NHANES) study, a cohort with a median serum level of 22 ng/ml. Additionally, the relationship between serum 25(OH)D and incidence of type 2 diabetes was examined. Serum 25(OH)D concentration was the variable of interest because it is a better indicator of vitamin D status than supplement intake or sun exposure because it accounts for multiple input sources and inter-individual variability in dose response.

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2. Materials and methods

2.1. GrassrootsHealth Cohort

This cross-sectional study utilized baseline data from GRH, a non-profit public health research organization running a large prospective population based study allowing participants to reach and sustain a serum 25(OH)D level of their choice, and tracking self-reported health status measures. Participants were individuals who responded to an invitation to attendees at a GRH seminar in 2008 and others recruited via internet invitations. There were no exclusion criteria for enrollment; participants included both genders, and wide ranges of ages and health statuses. Participation included submission of a home blood spot 25(OH)D test kit and completion of an online health questionnaire. Included in the test results were the normal reference ranges, information about potential toxicity levels, and suggested serum 25(OH)D concentrations (40–60 ng/ml) as recommended by a consortium of scientists and physicians [22]. All participants have given informed consent and this research study was approved by the Western Institutional Review Board (Olympia, WA) WIRB study 1126093.

Between January 2009 and July 2013, participants reported their gender, age, race, physical activity, and smoking status at study enrollment. Body mass index (BMI) was calculated using self-reported weight and height and categorized into 3 groups: <25, 25–30, >30. Regular exercise was defined as at least moderate physical activity for at least 20 min, 3 or more days/week. Race was categorized as "white" versus "non-white" and smoking status was categorized as "current smoker" versus "never/former smoker."

Serum 25(OH)D concentrations were determined by blood spot test kits analyzed at study enrollment using liquid chromatography-mass spectroscopy (LC-MS/MS) by ZRT Laboratory (Beaverton, OR). ZRT's assay has been validated against the LC-MS/MS consensus group reporting to the Vitamin D Quality Assessment Scheme (DEQAS), whose objective is to ensure the analytical reliability of 25(OH)D assays, with an R^2 value of 0.998. LC-MS/MS has been validated against the DiaSorin Radioimmunoassay (RIA) method with an R^2 value of 0.91 and with a slope not different from 1.0 [23].

In the GRH cohort, an incident case was defined as a self-reported diagnosis by a doctor of type 2 diabetes within the 12 months prior to enrollment based on the date of diagnosis. A date of diagnosis before this 12-month period was considered a prevalent case and excluded. This study included all GRH participants residing in the United States aged 20 years and older with no prior history of diabetes before the 12-month observation period (N = 4933). This age and residency group was chosen to match the NHANES cohort, which was a sample of the United States population and collected all covariate data for those aged ≥20 years. Age, gender, and race were available for all participants in this GRH cohort. BMI, smoking status, and physical activity were available for 90%, 89% and 89% of the cohort respectively.

2.2. NHANES Cohort

The 2005–2006 NHANES study population was a representative sample of the civilian, non-institutionalized United States population. NHANES used a complex, stratified, multistage, probability-cluster sampling design that oversampled low income persons, adolescents, the elderly, Blacks, and Mexican Americans to produce reliable estimates for these groups.

Detailed survey and examination methods can be found elsewhere [24]. Briefly, between January 2005 and December 2006, participants reported their gender, age, race, and physical activity via household interviews. BMI, regular exercise, race, and smoking status were defined, calculated, and categorized in the same manner as the GRH cohort mentioned above. Blood samples were collected by venipuncture in mobile examination centers and serum 25(OH)D concentrations were determined by using the DiaSorin RIA kit assay (Stillwater, MN) at the National Center for Environmental Health, CDC, Atlanta, GA.

In the NHANES cohort, an incident case was defined as a self-reported diagnosis of diabetes within the 12 months prior to the health interview. Specifically, the participant answered 'yes' to the question "Other than during pregnancy, have you ever been told by a doctor or health professional that you have diabetes or sugar diabetes?" and answered "12 months ago or less" to "When was your diabetes diagnosed?". Participants who answered "more than 12 months ago" were considered prevalent cases and excluded. To differentiate between type 2 and type 1 diabetes, participants who answered 'no' to both "Are you taking insulin now?" and "Are you now taking diabetic pills to lower your blood sugar?" were considered type 2 diabetes cases. Those who responded 'yes' to "Are you now taking diabetic pills to lower your blood sugar" (with or without insulin intake) were also considered type 2 diabetes cases.

This study included all 2005–2006 NHANES participants aged 20 years and older with no prior history of diabetes before the 12-month observation period and who completed the physical exam component where a valid 25(OH)D measurement was obtained (N = 4078). This age group was chosen because participants <20 years old were not assessed for smoking status, a key diabetes risk factor. All participants aged 1 year and older were eligible for the physical exam but among those ≥20 years, 484 did not participate in this component. Age, gender, race, smoking status, and physical activity were available for all participants in this NHANES cohort. BMI was available for all diabetes cases and 96% of the cohort.

2.3. Statistical Methods

Chi-square tests were used to test for differences between the GRH and NHANES cohorts. The unadjusted incidence rate of type 2 diabetes was calculated for the GRH and NHANES cohorts. An indirect rate adjustment was calculated according to the diabetes risk factors that were significantly different between the cohorts (age, gender, race, smoking status, and BMI). The NHANES population was used as the standard to simultaneously adjust for these risk factor differences in the GRH population. Specifically, gender, age, race, smoking status, and BMI-specific incidence rates from the NHANES population were applied to the gender, age, race, smoking status, and BMI distribution of the GRH cohort to estimate the expected number of cases. Participants with missing covariate data were distributed on the basis of existing data for each cohort. The ratio of observed to expected number of cases (standardized incidence ratio) and its 95% confidence interval (CI) were calculated. The Mantel-Haenszel (M-H) odds ratio estimate was calculated for the lowest 25(OH)D tertile (<17 ng/ml) versus the highest tertile (≥25 ng/ml) for the NHANES cohort, adjusting for age. Logistic regression was used to determine the association between 25(OH)D serum levels and the risk of developing type 2 diabetes within the NHANES cohort, adjusting for age, gender, race, BMI, physical activity, and smoking status. Modeling was confined to participants with valid values for all of the involved variables. The relationship between 25(OH)D serum levels and type 2 diabetes risk could not be assessed within the GRH cohort due to insufficient number of cases. Statistical analyses were performed using SPSS statistics version 22 (IBM, Armonk, NY).

3. Results

The median serum 25(OH)D concentration in the GRH cohort was 41 ng/ml (I-Q range: 31–55) and in the NHANES cohort was 22 ng/ml (I-Q range: 15–28) ($P < 0.0001$). In the GRH cohort, 77% of participants reported taking vitamin D supplements with a median daily intake of 2400 IU. In the NHANES cohort, 30% reported taking vitamin D supplements with a median daily intake of 400 IU. Among the 10 individuals who developed diabetes in the GRH cohort, 5 were below the median cohort serum level of 41 ng/ml and 5 were equal to or above it (Fig. 1). Among the 38 individuals who developed diabetes in the NHANES cohort, 31 were below the median cohort serum level of 22 ng/ml and 7 were equal to or above it. The GRH cohort had a statistically significant higher proportion of participants that were older, female, white, never/former smokers, and had a lower BMI (Table 1). Physical activity did not differ between the cohorts.

The unadjusted annual incidence rate within the GRH population was 2.0 per 1000 population (95% CI = 1.0, 3.6), compared to 9.3 per 1000 population (95% CI = 6.7, 12.6) within the NHANES population. After indirect adjustment for age, gender, race, smoking status, and BMI, the expected number of cases was 25 compared to the 10 observed GRH cases. The standardized incidence ratio was 0.40 (95% CI = 0.20, 0.71), or 60% lower risk in the GRH cohort (Fig. 2). The adjusted annual incidence rate within the GRH cohort was 3.7 per 1000 population (95% CI = 1.9, 6.6).

Using the Mantel-Haenszel (M-H) method to adjust for age, the lowest 25(OH)D tertile (<17 ng/ml) had higher odds of developing diabetes than the highest tertile (≥25 ng/ml) in the NHANES population (odds ratio: 8.0, $P = 0.001$). In the NHANES cohort, the lowest 25(OH)D tertiles (<17, 17–24 ng/ml) had higher odds of developing diabetes than the highest tertile (odds ratios: 4.9, $P = 0.02$ and 4.8, $P = 0.01$ respectively), adjusting for age, gender, race, BMI, physical activity, and smoking status (Table 2).

4. Discussion

The adjusted incidence rate of type 2 diabetes in a cohort with markedly higher than usual median serum 25(OH)D values (GRH) was less than half that in a cohort with lower median 25(OH)D (NHANES). While the cross-sectional method of calculating incidence for the GRH prospective cohort was not traditional, this method was chosen to parallel the procedure used in the NHANES study. To assess how this may have influenced the results, the incidence rate for those diagnosed with type 2 diabetes after enrollment among the at-risk population was calculated and found to be 1.2 per 1000 person-years (95% CI = 0.37, 2.81). This rate was comparable to the cross-sectional GRH rate and significantly lower than the NHANES rate.

Within the NHANES cohort, those with serum 25(OH)D levels below 25 ng/ml had almost 5 times the odds of developing diabetes compared to those with serum 25(OH)D levels ≥25 ng/ml. Other studies have found a similar reduction in risk of type 2 diabetes. A nested case-cohort study found a 50% lower hazard of developing type 2 diabetes for those with serum 25(OH)D levels <20 ng/ml compared to those with levels ≥32 ng/ml (95% CI = 0.32, 0.76) [14]. Another study found a 42% reduction in the risk of progression to type 2 diabetes from prediabetes or normal glucose tolerance in the highest 25(OH)D quartile (>28 ng/ml) compared to the lowest quartile (<18 ng/ml) [11]. Among those with prediabetes, there was a 62% reduction in the risk of diabetes comparing the highest quartile to the lowest quartile. A study presented at the 2014 Endocrine Society Meeting found a 58% reduction in the progression from prediabetes to diabetes in a group treated with calcium and 60,000 IU/week of vitamin D for eight weeks and then monthly compared to a group given only calcium supplements [25].

The distribution of the GRH cases across the 25(OH)D serum level spectrum, shown in Fig. 1, allows a very interesting interpretation. A recently published article presented guidelines to standardize individual studies of nutrients and meta-analyses based on the biological response to nutrients [26]. The measureable benefit for a nutrient-specific response is found within a narrow response region, with a flat response above and below this region (Fig. 3). Taking into account the sigmoidal nature of the nutrient response, a recent study used successive regression models to localize the association of vitamin D status with insulin resistance to the range of 16–36 ng/ml; with a flat extension for levels >32–36 ng/ml [27]. In the GRH cohort, 71% of participants had serum levels above 32 ng/ml and outside the range of association found in that study. With this in mind, the results of both cohorts would be consistent with a sigmoidal response between 25(OH)D and diabetes risk where there is a flat response below ~10 ng/ml, a clinical response between about 10 ng/ml and 30–35 ng/ml, and a plateau of no additional effect above ~30–35 ng/ml.

A recent systematic review and meta-analysis of randomized controlled trials found no effect of vitamin D supplementation on diabetes prevention [28]. All four studies included in the meta-analysis regarding progression to diabetes reported null results [29–32]. One of these studies had a relatively small number of

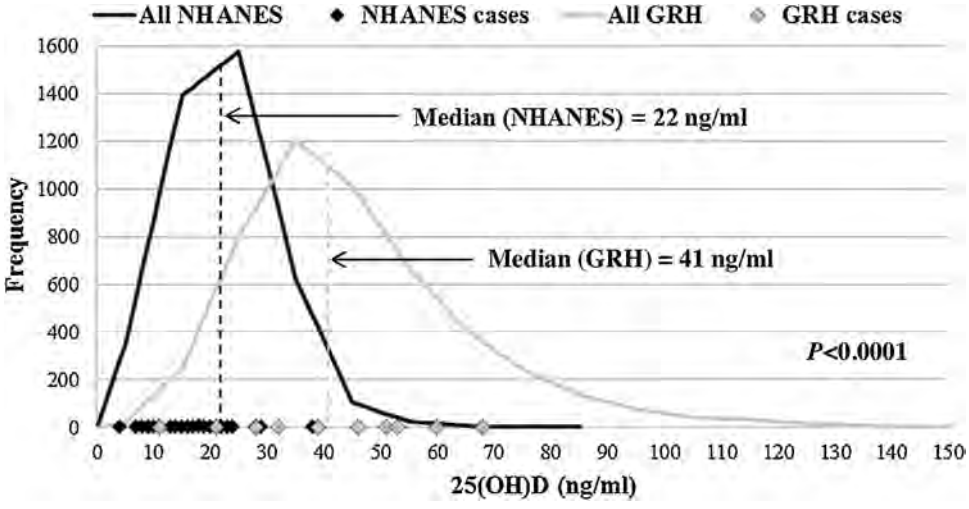

Fig. 1. Frequency distribution of serum 25–hydroxyvitamin D [25(OH)D] for GrassrootsHealth (GRH) ($N = 4933$) and NHANES ($N = 4078$) cohorts.

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Table 1
Demographic characteristics of GrassrootsHealth (GRH) ($N = 4933$) and NHANES ($N = 4078$) cohorts.

Characteristic	GRH N (%)	NHANES N (%)	x^2	P
Age (years)			600.13	<0.0001
20–39	892 (18%)	1671 (41%)		
40–59	2382 (48%)	1260 (31%)		
≥60	1659 (34%)	1147 (28%)		
Gender			206.31	<0.0001
Male	1632 (33%)	1956 (48%)		
Female	3301 (67%)	2122 (52%)		
Race			1991.86	<0.0001
White	4584 (93%)	2107 (52%)		
Non–white	347 (7%)	1971 (48%)		
BMI (kg/m^2)			367.22	<0.0001
<25	2463 (55%)	1416 (36%)		
25–30	1332 (30%)	1395 (36%)		
>30	654 (15%)	1105 (28%)		
Physical activity			1.46	0.227
Regular exercise	3046 (69%)	2864 (70%)		
Non-regular exercise	1367 (31%)	1214 (30%)		
Smoking status				
Current smoker	161 (4%)	904 (22%)	656.83	<0.0001
Never/former smoker	4219 (96%)	3171 (78%)		

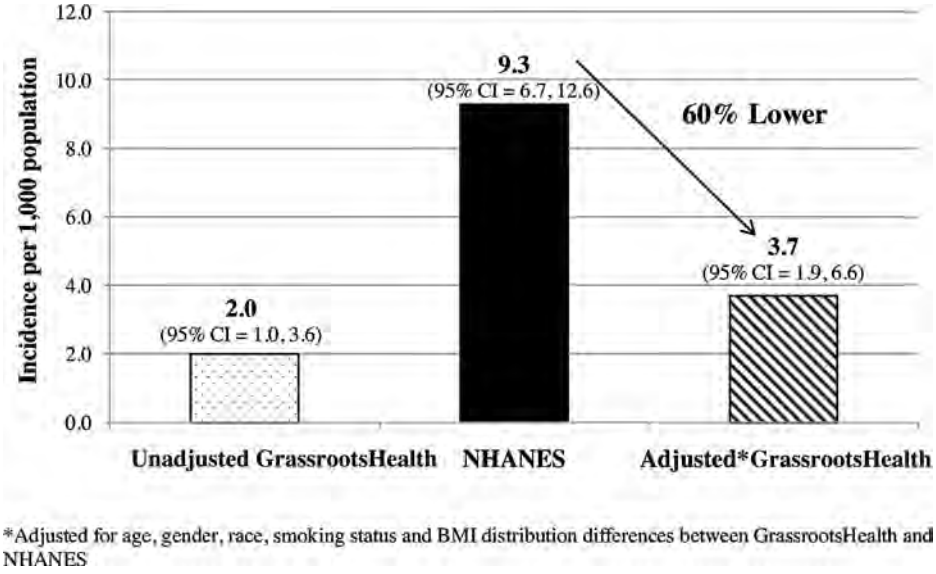

Fig. 2. Type 2 diabetes incidence rates in GrassrootsHealth (GRH) ($N = 4933$) and NHANES ($N = 4078$) cohorts.

participants and three studies administered vitamin D doses ≤800 IU/day, an intake amount that is unlikely to raise basal levels to a sufficient status, and did not limit their study population to only vitamin D deficient individuals. The nutrient-specific response depends on an individual's basal status where an increase in intake will produce a benefit in a deficient individual but will have a null effect in a replete individual [26]. Also, treating the relationship as linear, spread across the entire 25(OH)D range instead of a sigmoidal response would dilute the effect and may explain why some studies did not find a vitamin D association with diabetes. Additional randomized controlled trials that base their design on nutrient physiology are needed to accurately assess the association between vitamin D and diabetes.

Limitations of this study include the use of self-report data where recall bias may have occurred, and differences in methods and demographics between the GRH and NHANES cohorts may have limited comparability. The GRH cohort of individuals was self-selected for health consciousness and NHANES is a population-based sample. Also, two different assays were used to determine serum 25(OH)D concentration and while these methods were both calibrated against LC-MS/MS with high correlation, systematic differences are possible. This analysis took into account cohort differences for many of the key risk factors for type 2 diabetes but there were some factors such as waist circumference, diet, and socio-economic indicators that were not available. Lack of adjustment for these covariates or other unavailable or unknown variables may have influenced the outcome. Since multivariate logistic regression was conducted only within the NHANES cohort, analysis of the association between serum 25(OH)D and risk of type 2 diabetes was not affected by this limitation. Also, this study assumed the 25(OH)D levels measured in participants at enrollment were similar to their levels in the 12 months prior, back to the beginning of the period used to measure diabetes incidence.

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Table 2
Association between serum 25–hydroxyvitamin D [25(OH)D] levels and the risk of developing type 2 diabetes in the NHANES cohort, adjusting for covariates.

	NHANES (N = 4078)
Covariate	**OR (95% CI)**
Serum 25(OH)D (ng/ml)	
Lowest tertile (<17)	**4.90 (1.35, 17.86)**
Middle tertile (17–24)	**4.78 (1.37, 16.69)**
Highest tertile (≥25)	1.00
Age	
20–39 years	1.00
40–59 years	**3.75 (1.36, 10.34)**
≥60 years	**6.21 (2.22, 17.32)**
Gender	
Male	1.35 (0.70, 2.62)
Female	1.00
Race	
White	1.00
Non–white	1.84 (0.89, 3.80)
BMI	
<25	1.00
25–30	1.09 (0.37, 3.19)
>30	**3.83 (1.53, 9.59)**
Physical activity	
Regular exercise	1.00
Non-regular exercise	0.65 (0.31, 1.35)
Smoking status	
Current smoker	1.22 (0.56, 2.66)
Never/former smoker	1.00

Bold values signify significant adjusted odds ratios.

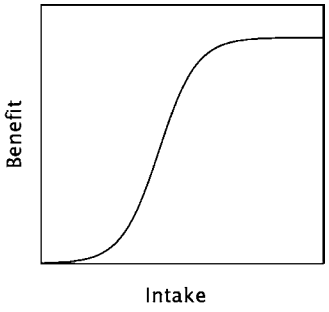

Fig. 3. A sigmoidal dose-response curve of the relation between nutrient intake and nutrient benefit.

While there are limitations to this study, these results add to the growing body of evidence supporting the association between higher serum 25(OH)D levels and a reduced risk of type 2 diabetes [5–21,25,27]. Higher vitamin D status has also been associated in other observational studies with a reduced risk of type 1 diabetes, cancer, myocardial infarction, and multiple sclerosis [22,33–38]. The Institute of Medicine (IOM) recommends levels of ≥20 ng/ml and considers 4000 IU/day as the safe upper intake level (SUIL) [39]. Other investigators and physicians have proposed a 25(OH)D concentration between 40 and 60 ng/ml as a safe range to achieve a reduction in risk of diseases associated with vitamin D deficiency [40–43]; this range can generally be achieved with the IOM SUIL of 4000 IU/day [44–45].

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Conflicts of interest

The authors have no conflicts of interest to disclose.

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The Effect of Improved Serum 25-Hydroxyvitamin D Status on Glycemic Control in Diabetic Patients: A Meta-Analysis

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Background: Type 2 diabetes is a global health concern, with an increased prevalence and high cost of treatment.

Objective: The aim of this systematic review and meta-analysis was to determine the effect of vitamin D supplementation and improved vitamin D status on glycemia and insulin resistance in type 2 diabetic patients.

Data Source: We searched PUBMED/Medline, Cumulative Index to Nursing and Allied Health, and Cochrane Library (until January 2017).

Study Selection: Prospective clinical trials were selected evaluating the impact of vitamin D supplementation on glycosylated hemoglobin (HbA1c), serum fasting plasma glucose (FPG), and homeostatic model assessment of insulin resistance (HOMA-IR) in diabetic patients.

Data Extraction and Synthesis: We used a random-effects model to synthesize quantitative data, followed by a leave-one-out method for sensitivity analysis. The systematic review registration was CRD42017059555. From a total of 844 entries identified via literature search, 24 controlled trials (1528 individuals diagnosed with type 2 diabetes) were included. The meta-analysis indicated a significant reduction in HbA1c [mean difference: −0.30%; 95% confidence interval (CI): −0.45 to −0.15, $P < 0.001$], FPG [mean difference: −4.9 mg/dL (−0.27 mmol/L); 95% CI: −8.1 to −1.6 (−0.45 to −0.09 mmol/L), $P = 0.003$], and HOMA-IR (mean difference: −0.66; 95% CI: −1.06 to −0.26, $P = 0.001$) following vitamin D supplementation and significant increase in serum 25-hydroxyvitamin D levels [overall increase of 17 ± 2.4 ng/mL (42 ± 6 nmol/L)].

Conclusions: Vitamin D supplementation, a minimum dose of 100 μg/d (4000 IU/d), may significantly reduce serum FPG, HbA1c, and HOMA-IR index, and helps to control glycemic response and improve insulin sensitivity in type 2 diabetic patients. (***J Clin Endocrinol Metab*** **102: 3097–3110, 2017)**

Type 2 diabetes has become a global health care problem. In North America, 57% of the total health care expenditure was spent on diabetes-related events in 2010, and it is estimated to grow by 34% between 2010 and 2030 (1). With its increasing prevalence and the high cost of treatment, diabetes places a remarkable economic burden on many countries (2). In Canada, diabetes prevalence rate was 9.2% in 2016, with the economic

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Abbreviations: 25(OH)D, 25-hydroxyvitamin D; BMI, body mass index; CI, confidence interval; FPG, fasting plasma glucose; HbA1c, glycosylated hemoglobin; HOMA-IR, homeostatic model assessment of insulin resistance; RCT, randomized control trial; SD, standard deviation; SE, standard error.

burden of $3.4 billion, which is estimated to increase to 41% by 2026 (3). Diabetes contributes to 30% of stroke, 40% of heart attacks, 50% of kidney failure requiring dialysis, and 70% of nontraumatic lower limb amputations, and is a leading cause of blindness (4). A quarter of Canadians with diabetes indicate that cost of treatment influences their adherence (5). Low-cost treatments are needed to reduce morbidity, long-term medical costs, and mortality (6).

Emerging evidence demonstrates that vitamin D supplementation may play a role in the prevention of type 2 diabetes. Vitamin D deficiency is involved in abnormal glucose metabolism, altered insulin secretion, and type 2 diabetes (7–10). Vitamin D deficiency is common in type 2 diabetes (11). Mitri *et al.* (7) found that even a slight increase in vitamin D intake [from <5 μg/d (200 IU/d) to 12.5 μg/d (>500 IU/d)] decreased the risk of type 2 diabetes by 13%. Likewise, compared with patients with serum 25-hydroxyvitamin D [25(OH)D] levels <14 ng/mL (35 nmol/L), individuals with levels >25 ng/mL (62.5 nmol/L) had 43% lower risk of developing type 2 diabetes. Vitamin D deficiency might induce glucose resistance through impairing insulin secretion. Supplementation with vitamin D has been demonstrated to contribute to optimized glucose homeostasis in patients with type 2 diabetes (12–14).

Mechanistically, vitamin D provides protection from diabetes-related complications through its anti-inflammatory and immune-modulatory effects (15, 16), as well as attenuating the expression of proinflammatory cytokines involved in insulin resistance like interleukin-1 and interleukin-6 (17). At a cellular level, the active form of vitamin D, 1,25-dihydroxyvitamin D, regulates expression of the insulin receptor gene (18, 19), facilitates glucose transport into muscle cells (20), and suppresses renin gene expression following hyperglycemia by blocking renin–angiotensin activity (21, 22). In addition, elevation of parathyroid hormone in response to vitamin D deficiency may also reduce insulin release from pancreatic β cells (23).

Despite promising results in longitudinal observational studies, demonstrating the inverse association between serum 25(OH)D status and type 2 diabetes, results of clinical trials with vitamin D have been inconclusive. In the systematic reviews conducted by George *et al.* (24), Pittas *et al.* (14), and Mitri *et al.* (7), there was an improvement in fasting plasma glucose (FPG) and insulin resistance, when they investigated the patients with diabetes or impaired glucose tolerance, rather than the healthy population. Still, the potential benefits of vitamin D supplementation on glycemic control and insulin sensitivity are debated by others (25–27). The lack of appropriate evidence for the beneficial effects of vitamin D might be attributed to suboptimal dosing (28, 29), short duration of supplementation (30, 31), small sample size (28, 29, 32), and comorbid conditions like obesity (33). Obesity is associated with systemic low-grade inflammation leading to insulin resistance and metabolic disorders such as diabetes (34). Several studies have reported that vitamin D improves insulin sensitivity and decreases inflammation (14, 35). Obese individuals are more likely to be vitamin D deficient, and need two to three times higher doses of vitamin D supplementation for repletion (36). Each unit (kg/m^2) increase in body mass index (BMI) is associated with a 1.15% decrease in serum 25(OH)D concentrations (37).

Current evidence is inconclusive, and it remains unclear whether vitamin D supplementation through clinical trials has a favorable effect on glycemic control in patients with type 2 diabetes. The objective of the current review was to resolve the uncertainty by systematically reviewing the literature and performing a meta-analysis of randomized controlled trials investigating the effects of vitamin D supplementation in type 2 diabetic patients on glycemic parameters, including FPG, homeostatic model assessment of insulin resistance (HOMA-IR), and glycosylated hemoglobin (HbA1c).

Materials and Methods

Literature search strategy

We designed this study according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Guidelines (38, 39). The protocol for our systematic review was registered with the International Prospective Register of Systematic Reviews, PROSPERO (registration CRD42017059555). The main exposure of interest was serum 25(OH)D concentration following vitamin D supplementation, and outcomes of interest were changes in HbA1c, FPG, and HOMA-IR levels subsequent to vitamin D administration and increased serum 25(OH)D levels in patients with type 2 diabetes. A comprehensive literature search [PubMed/Medline (Medical Literature Analyses and Retrieval System Online), Cochrane Central Register of Controlled Trials, and Cumulative Index to Nursing and Allied Health] was performed to identify articles from January 2000 until January 2017 that assessed the effect of vitamin D supplementation on glycemic measures in patients with type 2 diabetes.

Search terms included "type 2 diabetes mellitus" (or "HbA1c" or "hyperglycemia" or "insulin resistant" or "glucose") and "vitamin D" (or "vitamin D3" or "cholecalciferol" or "25 hydroxyvitamin D" or "vitamin D deficiency") in the title or abstract. The reference lists of the retrieved articles were scanned for additional eligible studies. An e-mail was sent to the correspondence author for additional data when relevant. Two authors (N.M. and M.M.) performed the initial screening of titles and abstracts.

Selection criteria

We reviewed all randomized control trials (RCTs) evaluating the effect of vitamin D administration on glycemic measures.

Eligible studies met the following criteria: (1) Study was placebo controlled; (2) study population was patients with type 2 diabetes; (3) participants were ≥18 years; (4) interventions were vitamin D supplementation with/without calcium supplementation vs placebo; (5) vitamin D supplementation dose was daily or weekly; (6) trial length was ≥2 months; (7) serum 25(OH)D levels and at least one of the glycemic measures (HbA1c, FPG, HOMA-IR) were reported at the beginning and at the end of the trial for both treated and control groups; and (8) study was published in English. Exclusion criteria were as follows: (1) nonclinical studies, observational studies, case-control or cross-sectional studies; (2) studies with insufficient information on outcomes, after the corresponding author was contacted; (3) narrative reviews, comments, opinion pieces, methodological reports, editorials, and letters; (4) study populations of healthy individuals, gestational diabetics, individuals with diabetic nephropathy, type 1 diabetics, and prediabetics; (5) intervention periods of <2 months; (6) vitamin D supplementation provided as a monthly or a single bolus dose; and (7) study performed in children (<18 years). Following the screening of titles and abstracts, duplicates were removed by two authors (N.M. and M.M.). Study selection, based on meeting the inclusion criteria, was approved by another author (S.M.K.). Any disagreements between the authors were resolved through discussion with the fourth author (H.V.) (Fig. 1).

Data extraction and management

Data were extracted by two authors (N.M., M.M.). Following assessment of methodological quality of the trials by the first and second reviewers (N.M. and M.M.), extracted data were approved by the other reviewers (S.M.K. and H.V.). Data extracted from each study included the following items: first author, reference, year of publication, country of study, study design, inclusion criteria, sample size, form of vitamin D, dose and frequency of vitamin D supplementation, method used for serum 25(OH)D measurement, any cosupplementation, calcium dose (if coadministered), control group, duration of supplementation, participants' characteristics [sex (n, % male), age, weight, BMI], comorbidities, baseline, and follow-up serum 25(OH)D levels and outcome measures (HbA1c, FPG, HOMA-IR).

Any further necessary calculation on study data, such as converting measuring units or calculating standard deviation (SD), was conducted by the first author (N.M.) and checked by another author (M.M.). Serum 25(OH)D levels were collated in nmol/L; a multiplication factor of 2.5 was used to convert 25(OH)D levels respectively from ng/mL to nmol/L (40). Plasma glucose levels were collated in mmol/L; we used a multiplication factor of 0.0555 to convert glucose levels respectively from mg/dL to mmol/L, as appropriate (41).

Quality assessment

The quality of selected RCTs was assessed by two authors (N.M., M.M.) using a checklist from the Cochrane Collaboration (42). The major criteria of the checklist were randomization, double blind (both patients and researcher/assessor), comparability of treatment groups, available follow-up information, if intent-to-treat analysis applied, and equal treatment used for treatment groups. The detailed checklist has been presented in the Cochrane Collaboration (42). Each criterion might be answered in three ways: yes (adequate information), no (inadequate information), or unclear information. Criteria answered with (1) yes, scored one point; (2) no, scored zero points; or (3) unclear information, scored as U and zero points. A total score was summed for each study. A study was considered good quality with a total score ≥9 points.

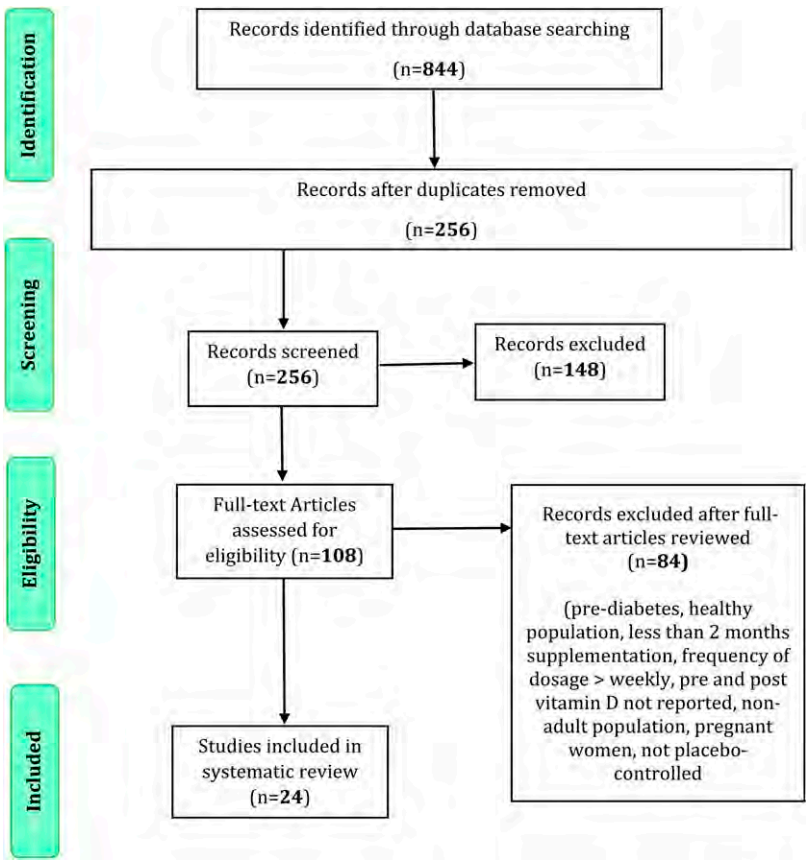

Figure 1. Study selection flow diagram (Preferred Reporting Items for Systematic Reviews and Meta-Analysis).

Data synthesis and statistical analysis

For each study, the effect size was calculated using the mean change from baseline in glycemic measures and SD for both treatment and control groups (42). The net change in each measurement was calculated by subtracting the mean measure at baseline from the mean measure at the end of the follow-up (43). SD was calculated using the standard error (SE) of the mean via the following formula: SD = SE of the mean × square root (n), where n is the number of the subjects (43). When SD of mean change for an outcome measure was not reported, we derived SD of mean change as the mean of the baseline and follow-up SDs for each group (24). If a study included more than two intervention groups, the highest dose of vitamin D supplementation was selected and its data presented in comparison with the placebo (control) group. If studies

compared both vitamin D and/or calcium supplementation vs placebo, they were treated as multiple studies (*i.e.*, vitamin D vs placebo and vitamin D plus calcium vs placebo).

Analyses were performed using Comprehensive Meta-Analysis V3 software (Biostat 2014, Englewood, NJ) (44). Random-effects models (DerSimonian-Laird method) were used to estimate expected heterogeneity of outcomes (45). Heterogeneity was assessed using I^2 index with I^2 values ≥50% corresponded to the use of random-effects model, and the values >60% to 70% indicated substantial heterogeneity (46). The effect size was reported using standardized mean difference with a 95% confidence interval (CI). Significance was considered a P value <0.05. A sensitivity analysis was performed using the leave-one-out method (removing one study each time and repeating the analysis) (47). To address the impact of unique populations, we removed the nine clinical trials conducted in Iran and repeated the meta-analysis.

Publication bias

Potential publication bias was assessed using a visual inspection of Begg funnel plot asymmetry and Egger weighted regression tests (48). The Duval and Tweedie trim-and-fill method was used to adjust the analysis for the effects of publication bias (49).

Subgroup analysis

To address heterogeneity among study populations, subgroup analyses were performed as follows: coadministration of calcium vs vitamin D supplementation alone; vitamin D insufficiency vs sufficiency (50) at the beginning of the trial [serum 25(OH)D level <20 ng/mL (<50 nmol/L) vs ≥ 20 ng/mL (≥50 nmol/L)]; and normal vs high body weight status [normal (BMI <25 kg/m^2) vs overweight and obese (BMI ≥25 kg/m^2)]. Where applicable, we examined changes in weight and BMI over time, following vitamin D supplementation.

Results

Summary of searches and study selection process

A total of 844 unique citations was identified through searches, of which 256 records remained after removal of duplicates. After screening via titles and abstracts, 108 articles remained for further evaluation. Following further evaluation, 84 more articles were excluded for the following reasons: study design was not RCT (n = 13), conducted in healthy population or prediabetics (n = 28), duration of follow-up was too short (<2 months) (n = 6), monthly or single bolus dose of vitamin D supplementation (n = 6), studies conducted in children or pregnant women (n = 19), insufficient information of vitamin D status at the beginning of the intervention and/or at the end of the trial (n = 12). For three studies, an e-mail request for additional data was sent to corresponding author of each study, but with no response these studies were removed from further analysis. Therefore, a total of 24 clinical trials including 1528 participants with type 2 diabetes was included in the current meta-analysis (Fig. 1).

Characteristics of the included studies

Detailed information of the included studies is summarized in Table 1 (12, 28–33, 51–65). There were 24 studies published between 2009 and 2016 that met the inclusion criteria from different countries, including United States of America (n = 1), East Asia (n = 2), South East Asia (n = 1), South West Asia (n = 1), Australia and New Zealand (n = 2), Iran (n = 9), other Middle East countries (n = 3), Israel (n = 1), Europe (n = 3), and Nigeria (n = 1). All were randomized placebo-controlled trials, including three studies that compared vitamin D–fortified yogurt with plain yogurt (placebo) (52, 56, 65). One study used a combination of vitamin D and 200 mg/d calcium vs 200 mg/d calcium alone (58); and one study compared a higher dose of vitamin D [30 μg/d (1200 IU/d)] with a lower dose placebo [10 μg/d (400 IU/d)] (29). With the exception of two studies that included only women participants (12, 65), all studies included both men and women. Mean age varied from 40 to 67 years (28, 61). At the beginning of the trial, mean serum 25(OH)D levels varied from 7 ng/mL (17 nmol/L) (55) to 34 ng/mL (84 nmol/L) (51) in the intervention group. Serum 25(OH)D concentration was measured using radioimmunoassay (n = 6) (12, 32, 33, 57, 59), high-performance liquid chromatography (n = 4) (51, 52, 55), chemiluminescence immunoassay (n = 5) (54, 60, 62, 64), liquid chromatography mass spectrometry (n = 1) (53), and enzyme-linked immunosorbent assay (n = 6) (29–31, 51, 63, 65), and the method was not reported for two studies (28, 61).

Eleven studies included only type 2 diabetic patients who were vitamin D insufficient based on the Institute of Medicine [serum 25(OH)D <20 ng/mL (<50 nmol/L)] (51) at the beginning of the trial (12, 29, 31, 53, 55, 57, 58, 60–63). Five studies included overweight and obese (BMI ≥25 kg/m^2) diabetic patients (28, 33, 54, 59, 60). A range of vitamin D doses, from 10 μg/d (400 IU/d) to 212 μg/d (8500 IU/d), was administered in these trials (61, 64). Six studies included weekly doses of vitamin D rather than daily supplementation (32, 33, 51, 57, 61, 63).

Calcium was coadministered with vitamin D in five studies (33, 52, 56, 58, 61). Duration of vitamin D supplementation ranged from 2 months to 12 months (28, 33, 54, 57). As the main exposure of interest, we looked into serum 25(OH)D concentration following vitamin D supplementation. The mean change in serum 25(OH)D levels between the intervention and control groups is summarized for each study in Supplemental Fig. 1. Except for one study conducted by Anyanwu *et al.* (55), all studies reported a significant increase in serum 25(OH)D levels in the intervention group compared with the placebo group. Following the consumption of an average of 105 μg/d (4200 IU/d) vitamin D, compared

Table 1. Characteristics of Included Studies

Reference	Location	N	Study Population	Mean Age	% Male	Duration of Trial	Vitamin D Dose	Control Group	Other Treatments	Treated Group 25(OH)D ng/mL (nmol/L)		Outcomes Measured	25(OH)D Assay Method
										Baseline	End of Study		
von Hurst *et al.* (12)	New Zealand	81	Insulin resistant, vitamin D deficient <50	45	0	6 months	100 μg/d (4000 IU/d)	Placebo		8 (21)	32 (80)	FPG, HOMA-IR	RIA
Nasri *et al.* (51)	Iran	60	T2DM	55	28	12 weeks	50,000 IU/wk (~178 μg/d/ 7140 IU/d)	Placebo		34 (84)	66 (164)	HbA1c	ELISA
Shab-Bidar *et al.* (52)	Iran	100	T2DM	48	43	12 weeks	25 μg/d (1000 IU/d) (D3-fortified yogurt drink)	Placebo (yogurt drink)	Calcium (340 mg/d), oral hypoglycemic medication	15 (38)	29 (72)	HbA1c, FPG	HPLC
Breslavsky *et al.* (28)	Israel	47	T2DM, overweight & obese	67	23	12 months	25 μg/d (1000 IU/d)	Placebo		13 (32)	19 (47)	HbA1c, FPG	NA
Al-Sofiani *et al.* (53)	Saudi Arabia	20	Insulin resistant, vitamin D deficient (<50 nmol/L)	48	75	12 weeks	125 μg/d (5000 IU/d)	Placebo		10 (25)	36 (91)	HbA1c, FPG, HOMA-IR	LC-MS/MS
Yousefi Rad *et al.* (54)	Iran	58	T2DM, overweight	45	38	2 months	100 μg/d (4000 IU/d)	Placebo		16 (39)	28 (69)	HbA1c, FPG, HOMA-IR	CLIA
Anyanwu *et al.* (55)	Nigeria	42	T2DM, vitamin D deficient (<50 nmol/L)	50	43	12 weeks	75 μg/d (3000 IU/d)	Placebo		7 (17)	8 (19)	HbA1c, FPG	HPLC
Nikooyeh *et al.* (56)	Iran	60	T2DM	45	39	12 weeks	25 μg/d (1000 IU/d) (D3-fortified yogurt drink)	Placebo (yogurt drink)		17 (42)	31 (78)	HbA1c, FPG, HOMA-IR	HPLC
Nikooyeh *et al.* (56)	Iran	60	T2DM	45	39	12 weeks	25 μg/d (1000 IU/d) (D3-fortified yogurt drink)	Placebo (yogurt drink)	Calcium (500 mg/d)	17 (42)	30 (75)	HbA1c, FPG, HOMA-IR	HPLC
Patel *et al.* (29)	US	24	T2DM, vitamin D deficient (<62.5 nmol/L)	57	29	4 months	30 μg/d (1200 IU/d)	400 IU/d D3		17 (42)	28 (69)	HbA1c, FPG	ELISA
Tabesh *et al.* (57)	Iran	60	T2DM, nonsmoker, vitamin D deficient (<75 nmol/L)	50	48	2 months	50,000 IU/wk (~178 μg/d/ 7140 IU/d)	Placebo	Calcium placebo	11 (28)	32 (80)	HbA1c, FPG, HOMA-IR	RIA
Tabesh *et al.* (57)	Iran	60	T2DM, nonsmoker, vitamin D deficient (<5 nmol/L)	50	48	2 months	50,000 IU/wk (~178 μg/d/ 7140 IU/d)	Placebo (vitamin D & calcium)	Calcium (1000 mg/d)	12 (30)	30 (75)	HbA1c, FPG, HOMA-IR	RIA
Yiu *et al.* (30)	Hong Kong	100	T2DM	66	50	12 weeks	125 μg/d (5000 IU/d)	Placebo		8 (21)	58 (146)	HbA1c, FPG	ELISA
Jorde & Figenschau (32)	Norway	32	T2DM	48	56	6 months	40,000 IU/wk (~143 μg/d/ 5715 IU/d)	Placebo		24 (60)	47 (118)	HbA1c, FPG, HOMA-IR	RIA
Ryu *et al.* (58)	Korea	129	T2DM, vitamin D deficient (<50 nmol/L)	49	61	24 weeks	50 μg/d (2000 IU/d)	200 mg/d calcium	Calcium (200 mg/d)	11 (27)	30 (76)	HbA1c, FPG, HOMA-IR	CLIA
Kampmann *et al.* (31)	Denmark	16	T2DM, vitamin D deficient (<50 nmol/L)	Over 18	50	12 weeks	11,200 IU/d for 2 wk then 5600 IU/ d for 10 wk (~23 μg/d/ 933 IU/d)	Placebo		12 (31)	42 (105)	HbA1c, FPG	ELISA
Elkassaby *et al.* (59)	Australia	50	T2DM, obese	53	42	6 months	150 μg/d (6000 IU/d)	Placebo		24 (59)	51 (128)	HbA1c, FPG, HOMA-IR	RIA
Sadiya *et al.* (60)	Emirates	87	T2DM, vitamin D deficient (<50), obese	45	18	6 months	6000 IU/d for 3 mo then 3000 IU/ d for 3 mo (~112 μg/d/4500 IU/d)	Placebo		11 (28)	25 (62)	HbA1c, FPG	CLIA
Jorde *et al.* (33)	Norway	88	T2DM or impaired glucose tolerance, obese	45	43	1 year	40,000 IU/wk (~143 μg/d/ 5715 IU/d)	Placebo	Calcium (500 mg/d)	24 (60)	49 (123)	HbA1c, FPG, HOMA-IR	RIA
Kota *et al.* (61)	India	30	T2DM, TB, vitamin D deficient (<50 nmol/L)	40	66	12 weeks	60,000 IU/wk (~214 μg/d/ 8571 IU/d)	Placebo	Calcium (1000 mg/d), anti-TB medication	18 (45)	26 (64)	FPG, HbA1c	NA
Dalan *et al.* (62)	Singapore	61	T2DM, vitamin D deficient (<50 nmol/L)	53	54	16 weeks	4000 IU/d for 8 wk then 2000 IU/ d for 8 wk (~75 μg/d/3000 IU/d)	Placebo		18 (45)	32 (79)	HbA1c	CLIA
Al-Zahrani *et al.* (63)	Saudi Arabia	183	T2DM, vitamin D deficient (<50 nmol/L)	55	49	3 months	45,000 IU/wk for 2 mo then 1 bolus 45000 IU (~161 μg/d/6429 IU/d)	Placebo		10 (25)	33 (83)	FPG, HbA1c	ELISA
Ghavamzadeh *et al.* (64)	Iran	51	T2DM	51	41	14 weeks	10 μg/d (400 IU/d)	Placebo		8 (21)	18 (46)	HbA1c	CLIA
Jafari *et al.* (65)	Iran	59	T2DM, postmenopausal women	57	0	12 weeks	50 μg/d (2000 IU/d) (D3-fortified yogurt)	Placebo (plain yogurt)		25 (62)	35 (87)	HbA1c, FPG, HOMA-IR	ELISA

Abbreviations: CLIA, chemiluminescence immunoassay; ELISA, enzyme-linked immunosorbent assay; HPLC, high-performance liquid chromatography; LC-MS/MS, liquid chromatography mass spectrometry; RIA, radioimmunoassay; T2DM, type 2 diabetes mellitus; TB, tuberculosis.

with placebo, there was an overall increase of 17 ± 2.4 ng/mL (42 ± 6 nmol/L) in serum 25(OH)D levels. Because the mean of vitamin D supplementation dose across all included studies was 102 ± 61 μg/d (4074 ± 2450 IU/d) and the median 106 μg/d (4250 IU/d), a minimum dose of 100 μg/d (4000 IU/d) was recommended for vitamin D–lowering effect on glycemic measures (24).

BMI and its change over time were reported in 14 trials (28–33, 52, 53, 57, 58, 61–65). Following vitamin D supplementation, there was a slight decrease in BMI, compared

with the placebo (−0.19 kg/m^2; 95% CI: −0.34 to −0.04, P = 0.01) (Supplemental Fig. 2). Body weight information was available for five studies (52, 56, 60, 64, 65). Vitamin D–supplemented individuals did not show any significant change in body weight, relative to individuals in the placebo groups (−0.51 kg; 95% CI: −1.32 to 0.30, P = 0.2).

Risk of bias assessment

All included studies had a low risk of bias according to randomization, allocation concealment, and comparability of intervention groups at the beginning of the trial and equal treatment of intervention groups. However, there was a lack of information about intention-to-treat analysis. The quality assessment of the included trials resulted in 17 of 22 studies showing good quality, with the Cochrane score ≥9 (28, 30, 31, 33, 51–54, 56–60, 62–65) (Supplemental Table 1).

Pooled estimate of the effect of vitamin D on glycemic measures

Effect on HbA1c

There were 23 studies with sufficient data to be included in the meta-analysis to measure the overall effect of vitamin D supplementation and improved serum 25(OH)D status on HbA1c (28–33, 51–65). The total number of included diabetic patients was 1477; of these, 746 received vitamin D supplementation with or without calcium, and 731 patients received placebo. Ten of 23 studies reported a significant reduction in HbA1c after vitamin D supplementation compared with placebo (51, 54, 55–57, 59, 61, 64, 65). Three additional studies showed a decreasing trend in the mean change of HbA1c in the vitamin D group compared with the placebo group; however, these differences were not statistically significant (52, 53, 60).

Based on a random-effect meta-analysis, comparing the mean change in HbA1c from baseline between vitamin D–supplemented and placebo groups, the overall effect was a significant reduction in HbA1c after vitamin D supplementation (standardized difference in mean: −0.30%; 95% CI: −0.45 to −0.15, $P < 0.001$) (Fig. 2).

In three studies, coadministration of vitamin D with calcium led to a significant decrease in HbA1c in the treated group vs placebo group (56, 57, 61). There was a significantly greater reduction in the mean change of HbA1c in the vitamin D with calcium of −0.50% ± 0.2 (95% CI: −0.89 to −0.09, P = 0.01) compared with vitamin D group of −0.25% ± 0.08 (95% CI: −0.41 to −0.09, P = 0.003; Table 2). In a subgroup analysis based on BMI at the beginning of the trial (<25 kg/m^2 as nonobese vs ≥25 kg/m^2 as obese), a significantly greater

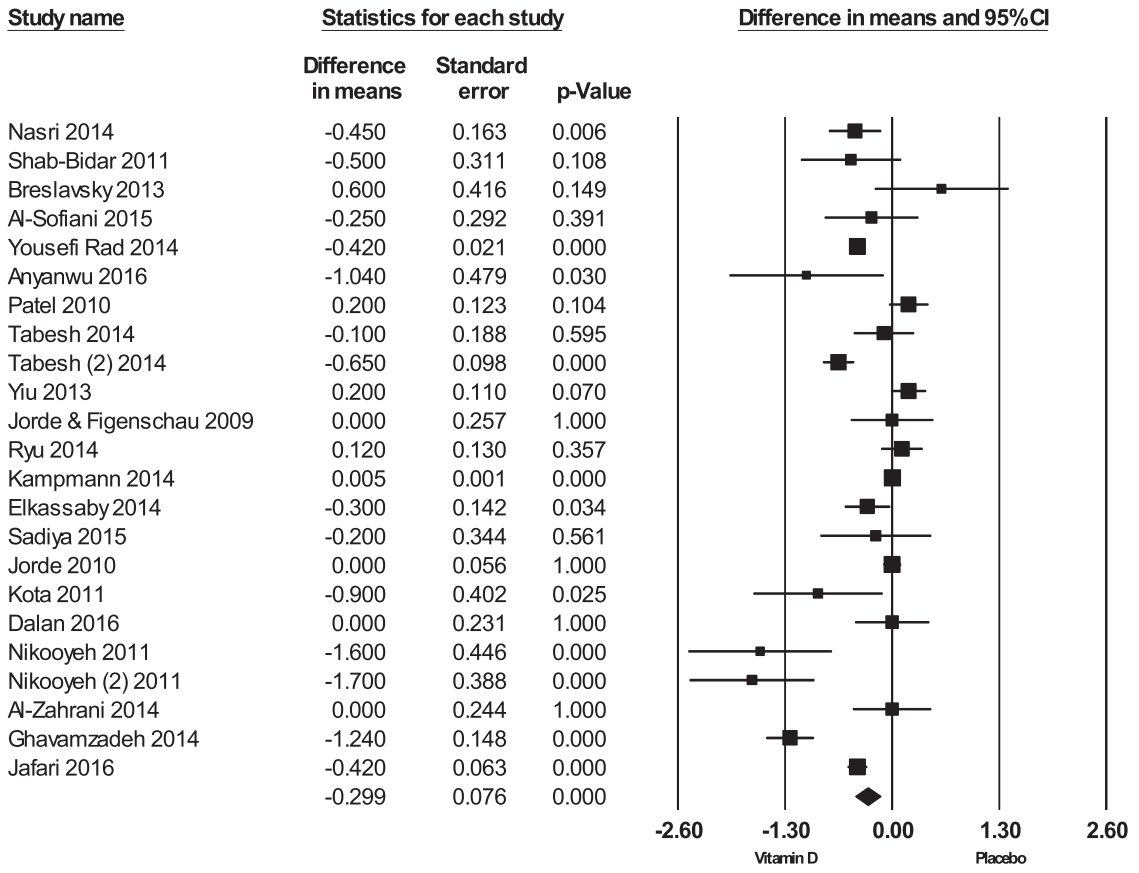

Figure 2. Mean difference in the change of HbA1c (%) for vitamin D–supplemented and control groups. Data from (12, 28–32, 52–66).

Table 2. Meta-Analysis and Subgroup Analysis of Primary and Secondary Outcomes

Subgroup Analysis	No. of Study	No. of Subjects		Mean Difference (95% CI)	*P* Value
		Vitamin D	Placebo		
Concomitant use of Ca					
HbA1c (%)					
D vs placebo	18	643	642	−0.25 ± 0.08 (−0.41 to −0.09)	0.003
D + Ca vs placebo	6	239	228	−0.50 ± 0.2 (−0.89 to −0.09)[a]	0.01
FPG (mg/dL)					
D vs placebo	16	598	596	−6.7 ± 2.2 (−11.0 to −2.2)	0.003
D + Ca vs placebo	6	239	228	−9.5 ± 4.9 (−18.9 to −0.2)[a]	0.04
HOMA-IR					
D vs placebo	8	212	208	−0.62 ± 0.3 (−1.2 to −0.05)	0.03
D + Ca vs placebo	4	174	163	−0.69 ± 0.3 (−1.34 to −0.04)	0.04
Obesity					
HbA1c (%)					
Obese	5	173	157	−0.16 ± 0.15 (−0.45 to 0.132)	0.2
Nonobese	19	709	713	−0.34 ± 0.08 (−0.51 to −0.18)[a]	< 0.001
FPG (mg/dL)					
Obese	5	173	157	−5.0 ± 1.8 (−8.6 to −1.3)	0.009
Nonobese	17	664	667	−8.1 ± 2.7 (−13.3 to −2.7)[a]	0.003
HOMA-IR					
Obese	3	104	92	−0.28 ± 0.16 (−0.60 to 0.04)	0.09
Nonobese	9	388	389	−0.74 ± 0.26 (−1.25 to −0.22)[a]	0.005
25(OH)D level at baseline					
HbA1c (%)					
<20 ng/mL	12	382	381	−0.29 ± 0.13 (−0.55 to −0.03)	0.02
≥20 ng/mL	12	500	489	−0.29 ± 0.09 (−0.46 to −0.12)	0.001
FPG (mg/dL)					
<20 ng/mL	11	367	365	−1.1 ± 1.4 (−4.0 to 1.6)	0.4
≥20 ng/mL	11	470	459	−8.6 ± 2.7 (−13.9 to −3.4)[a]	0.001
HOMA-IR					
<20 ng/mL	6	312	313	−0.43 ± 0.29 (−0.99 to 0.14)	0.1
≥20 ng/mL	6	180	168	−0.82 ± 0.32 (−1.44 to −0.20)[a]	0.01

Abbreviation: Ca, calcium.

[a]Significant difference between groups (t-test, $P < 0.05$).

mean reduction in HbA1c was observed in nonobese participants (−0.34%; 95% CI: −0.51 to −0.18, $P < 0.001$) compared with obese group (−0.16%; 95% CI: −0.45 to 0.13, $P = 0.2$). The average vitamin D supplementation dose in obese patients was 4220 IU/d, and, although still below the optimal level (40 ng/mL), serum 25(OH)D levels doubled (from 18 to 34 ng/mL). Serum 25(OH)D level at baseline [<20 ng/mL (<50 nmol/L) vs ≥20 ng/mL (≥50 nmol/L)] did not affect the changes in HbA1c after vitamin D supplementation (Table 2).

Risk of bias assessment based on inclusion of the studies that were characterized as good quality, based on Cochrane score ≥9, did not change the overall result (mean change: −0.31; 95% CI: −0.47 to −0.15, $P < 0.001$). Heterogeneity was present ($I^2 = 96\%$), and visual inspection of funnel plot symmetry did suggest potential publication bias [Fig. 3(a)], which was confirmed by Egger's linear regression (intercept = −2.6; SE = 1.03; 95% CI: −4.75 to −0.43, t = −2.5, $P = 0.02$). We adjusted the effect size for potential publication bias using the trim and fill correction (with no potentially missing study to be imputed in the funnel plot) and found an overall reduction in HbA1c with vitamin D supplementation (with or without calcium) of 0.30% [95% CI: −0.45 to −0.15, $P < 0.001$; Fig. 3(b)].

Effect on FPG

There were 21 studies that reported FPG as an outcome measure (12, 28–33, 52–61, 63, 65). Six studies reported a significant reduction in FPG (52, 54, 56, 61, 63, 65), whereas three studies demonstrated a decreasing trend in FPG after vitamin D supplementation (55, 59, 60).

A pooled meta-analysis including 1386 patients with type 2 diabetes (n = 701 treated with vitamin D and n = 685 with placebo) was performed to compare the mean change in FPG between the beginning and the end of study. Vitamin D supplementation resulted in a significant reduction of FPG with a standardized mean difference of −4.9 mg/dL (−0.27 mmol/L) [95% CI: −8.2 to −1.7 (−0.45 to −0.09 mmol/L), $P = 0.003$, $I^2 = 52\%$; Supplemental Fig. 3].

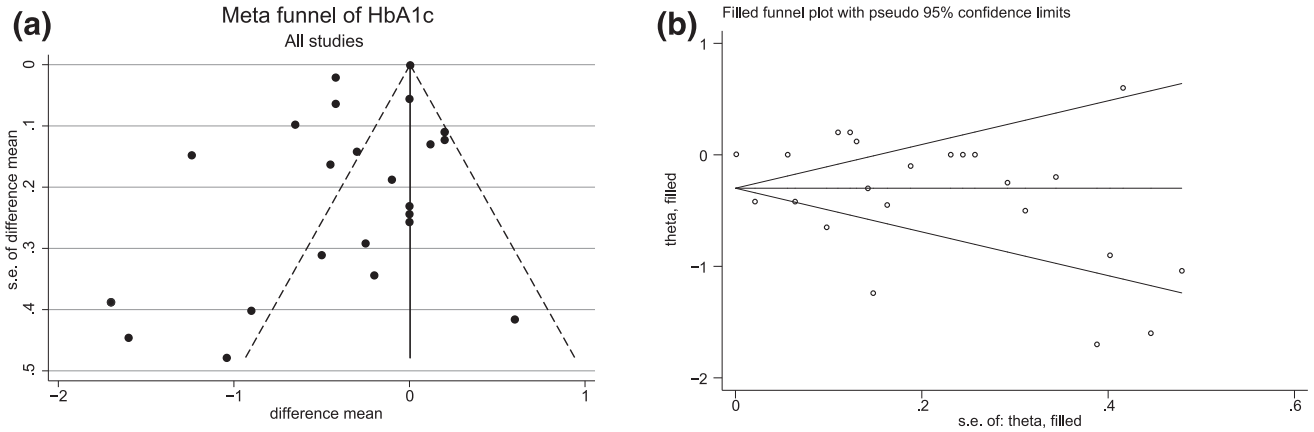

Figure 3. Funnel plot detailing publication bias in the selected studies for HbA1c analysis. (a) Funnel plot of SE by standardized mean difference; closed circles represent observed published studies. (b) Trim-and-fill method to impute for potentially missing studies; open circles represent observed published studies.

No evidence of publication bias was detected using funnel plot [Supplemental Fig. 4(a)] or Egger's test (intercept = −0.53; SE = 0.43; 95% CI: −1.44 to 0.37, t = −1.24, $P = 0.23$). Effect size was adjusted for potential publication bias (trim and fill correction) with no potentially missing study to be imputed in the funnel plot. The adjusted effect size of vitamin D supplementation on FPG was −4.9 mg/dL (−0.27 mmol/L) [95% CI: −8.2 to −1.7 (−0.45 to −0.09 mmol/L), $P = 0.003$; Supplemental Fig. 4(b)]. The result did not differ when only the good quality studies (Cochrane score ≥9) were assessed [mean change of −5.0 mg/dL (−0.28 mmol/L); 95% CI: −8.8 to −1.4 (−0.49 to −0.08 mmol/L), $P = 0.006$].

Subgroup analysis of FPG is shown in Table 2. Coadministration of calcium significantly promoted the effect of vitamin D supplementation on FPG. Patients supplemented with both vitamin D and calcium demonstrated greater reduction in FPG [−9.5 mg/dL (−0.53 mmol/L); 95% CI: −18.9 to −0.2 (−1.05 to −0.01 mmol/L), $P = 0.04$] compared with those who received vitamin D alone [−6.7 mg/dL (−0.37 mmol/L); 95% CI: −11.0 to −2.2 (−0.61 to −0.12 mmol/L), $P = 0.003$]. Nonobese patients showed a greater reduction in FPG [−8.1 mg/dL (−0.45 mmol/L); 95% CI: −13.3 to −2.7 (−0.74 to −0.15 mmol/L), $P = 0.003$] compared with obese group [−5.0 mg/dL (−0.28 mmol/L); 95% CI: −8.6 to −1.3 (−0.48 to −0.07 mmol/L), $P = 0.009$]. The impact of vitamin D supplementation on FPG was influenced by serum 25(OH)D status at the beginning of the intervention. Diabetic patients who were vitamin D insufficient at baseline did not show any significant reduction in FPG after vitamin D supplementation [−1.1 mg/dL (−0.06 mmol/L); 95% CI: −4 to −1.6 (−0.22 to 0.09 mmol/L), $P = 0.4$), but those with serum 25(OH)D level ≥20 ng/mL (≥50 nmol/L) had a significant reduction in FPG over time [−8.6 mg/dL (−0.48 mmol/L); 95% CI: −13.9 to 3.4 (−0.77 to −0.19 mmol/L), $P = 0.001$].

Effect on insulin resistance (HOMA-IR)

Twelve studies provided sufficient data to measure the overall effect of vitamin D supplementation on insulin resistance using HOMA-IR (12, 32, 33, 53, 54, 56–59, 65). The total number of included diabetic patients was 757, of whom 386 were included in the vitamin D group and 371 in the placebo group. Seven of the 12 studies observed a significant reduction in insulin resistance after vitamin D intervention compared with placebo (12, 33, 54, 56, 57, 65) and five did not.

We found a significant lowering effect of vitamin D supplementation on insulin resistance compared with controls (standardized difference in means: −0.66; 95% CI: −1.06 to −0.26, $P = 0.001$; Supplemental Fig. 5).

Asymmetry of funnel plot was suggestive of potential publication bias [Supplemental Fig. 6(a)], but Egger's test did not find a publication bias (intercept = −1.76; SE = 2.6; 95% CI: −7.5 to 3.98, t = −0.68, $P = 0.51$). To evaluate potential publication bias, the effect size was adjusted using the trim and fill correction, and one missing study was imputed in the funnel plot [Supplemental Fig. 6(b)]. The adjusted mean difference was −0.72 (95% CI: −1.11 to −0.33, $P < 0.001$).

Calcium was coadministered with vitamin D in four studies (33, 56–58) with no significant effect on HOMA-IR changes (Table 2). Obesity inversely influenced insulin resistance. The reduction in HOMA-IR was significant in nonobese (−0.74; 95% CI: −1.25 to −0.22, $P = 0.005$) but not in obese participants (−0.28; 95% CI: −0.60 to 0.04, $P = 0.09$). The impact of vitamin D supplementation on insulin resistance was influenced by baseline serum 25(OH)D status. Patients who were vitamin D insufficient at baseline did not show any significant reduction in

HOMA-IR after vitamin D supplementation (−0.43; 95% CI: −0.99 to 0.14, P = 0.1), whereas HOMA-IR was significantly reduced in those with serum 25(OH)D levels ≥20 ng/mL (≥50 nmol/L) (−0.82; 95% CI: −1.44 to −0.20, P = 0.01).

Sensitivity analysis

Using the leave-one-out method, the pooled effect of vitamin D supplementation on HbA1c, FPG, and HOMA-IR remained similar across all included studies. This confirmed that the significant effect of vitamin D supplementation on glycemic measures was the overall effect of all included studies.

After removing the nine trials conducted in Iran, HbA1c (−0.105%; 95% CI: −0.27 to 0.06, P = 0.2), FPG (−1.6 mg/dL; 95% CI: −4.47 to 1.35, P = 0.2), and HOMA-IR (−0.09; 95% CI: −0.41 to 0.23, P = 0.4) were not significantly reduced following vitamin D supplementation compared with the placebo. Removing these studies decreased the power such that 69.5%, 67.0%, and 52.8% of the population remained for HbA1c, FPG, and insulin, respectively. However, glycemic parameter changes were in the same direction with vitamin D supplementation.

Discussion

We conducted a systematic review and meta-analysis of 24 RCTs to determine the efficacy of vitamin D supplementation on glycemic control and insulin sensitivity in diabetic patients. This unique meta-analysis was comprised of well-designed clinical trials centered on diabetic patients from diverse countries with high prevalence of vitamin D deficiency and poorly controlled type 2 diabetes. Extended follow-up periods (average of 7 months) and high daily doses (average of 4200 IU/d) increased the chances of achieving physiologically favorable levels of serum 25(OH)D (100 to 130 nmol/L), which is essential for better glycemic controls. Our meta-analysis found that vitamin D supplementation and subsequent increased serum 25 (OH)D levels improved glucose control and insulin resistance in type 2 diabetic patients. Significant reductions in HbA1c, FPG, and HOMA-IR were found with vitamin D supplementation.

Overall, vitamin D supplementation seems to be efficacious as an adjuvant treatment of diabetes-related glucose metabolism disorders. The results of the current meta-analysis suggest that a minimum dose of 100 μg/d (4000 IU/d), which is equivalent to the tolerable upper intake level of vitamin D for adults (66), is required to have a protective effect on glucose homeostasis in type 2 diabetic patients.

Vitamin D deficiency, like other nutritional deficiencies, may compromise different body functions like glucose homeostasis (67). A majority of diabetic patients have been found to be vitamin D insufficient (68). Observational studies demonstrate an inverse association between serum 25(OH)D levels and the incidence of type 2 diabetes (69). In agreement with our findings, other studies have reported that vitamin D supplementation improves glycemic control and insulin sensitivity (7, 14, 54, 61, 65).

However, as may be expected with varied study designs (such as dose, duration, population characteristics, concomitant medications, etc.), results from numerous other RCTs have conflicted. A recent meta-analysis by Krul-Poel *et al.* (70), for instance, did not recover any beneficial effect of short-term vitamin D supplementation in a diverse population with type 2 diabetes. Yet, it is notable that these authors principally included trials that used single or monthly vitamin D supplementation, despite evidence that the two are not equivalent and daily doses are recommended (71). Krul-Poel *et al.* (70) also included clinical trials with relatively short follow-up periods, often <3 months. This is particularly problematic because HbA1c has a life span of ~100 days (72), meaning that any change induced would take longer to detect. In our meta-analysis, studies shorter than 2 months in duration were excluded to account for biology, and the average of follow-up periods was 7 months. As a result of the study inclusion criteria, the average vitamin D supplementation dose in the study by Krul-Poel *et al.* (70) was lower than that used in the present meta-analysis (3600 IU/d compared with 4200 IU/d), and the average increase in serum 25(OH) levels was less (12 ng/mL compared with 17 ng/mL).

Krul-Poel *et al.* (70) did, however, find beneficial effect of vitamin D in diabetic patients with poor glycemic control. Previous works had noted that in compromised conditions (high and poorly controlled HbA1c), vitamin D supplementation might improve glycemic measures even with lower doses and shorter period of supplementation (70, 72). The results of our meta-analysis further corroborate these findings.

Our systematic review showed that baseline vitamin D insufficiency had a negative influence on glycemic measure outcomes such that positive outcomes were found with higher baseline 25(OH)D levels (Table 2). The authors posit that optimal glucose homeostasis is enabled by a physiological vitamin D status achieved through targeted supplementation and/or regular sun exposure containing UVB, a level that may be reflected by serum 25(OH)D concentrations >40 ng/mL (100 nmol/L) (73). In the current study, we found that 100 μg/d (4000 IU/d) vitamin D was required for efficacy.

There is evidence that body weight loss improves some biomarker concentrations, including cholesterol, glucose, and insulin (74). As such, the positive results observed in single vitamin D supplementation trials could be seen as a consequence of energy restriction and weight loss; the lack of appropriate response in obese individual might also be related to weight control failure (75). However, a closer examination of the trials included in our meta-analysis revealed that there were no significant weight reductions that could have boosted glycemic control. In addition, the diet and medications of the supplemented and placebo groups in the included trials were comparable, and even a slight decrease in BMI over time might be attributed to improved serum 25(OH)D levels in vitamin D–supplemented group. Significant reductions in FPG and HOMA-IR were also recorded in obese individuals; therefore, the lack of a response in obese diabetic patients might be related to lack of vitamin D repletion [serum 25(OH)D levels ≥75 nmol/L] rather than controlling weight (25, 76). von Hurst *et al.* (12) similarly showed significant improvement in insulin resistance among insulin-resistant women, despite there being no effect on body weight or C-reactive protein level after 6 months of 4000 IU/d vitamin D supplementation. Overall, improved serum 25(OH)D levels have shown promising results for glycemic control, although other parameters such as age, season, ethnicity, obesity, and physical activity level should be taken into consideration.

We found that reductions in HbA1c, FPG, and HOMA-IR were all significantly greater in nonobese patients (Table 2). This may be due to the influence of body mass (fat mass) on the required vitamin D dose to achieve the same serum 25(OH)D. Maintaining the physiological levels of serum 25(OH)D [40 (100 nmol/L) to 52 ng/mL (130 nmol/L)] is essential for many body organs and their proper function, including the pancreas and β cell function and, subsequently, glycemic control. Serum 25(OH)D values >40 ng/mL (100 nmol/L) require a total vitamin D intake in the range of 100 to 150 μg/day (4000 to 6000 IU/d) in normal populations (77). Overweight and obese individuals need an average dose of 150 μg/day (6000 IU/d) to achieve serum 25(OH)D concentrations of 20 ng/mL (50 nmol/L) (36). To obtain physiological levels, obese individuals require doses in excess of 150 μg/day (two to three times as much vitamin D as normal weight individuals). It is postulated that higher doses of vitamin D may be required to compensate for vitamin D trapped in fat mass and/or inadequate vitamin D status (73, 78, 79).

The recommended vitamin D supplementation dose suggested by this meta-analysis [100 μg/d (4000 IU/d)] is likely to result in serum 25(OH)D levels of >40 ng/mL (100 nmol/L) in normal weight and possibly overweight patients; however, these doses should be adjusted in obese diabetic patients (78). The overall increase in 25(OH)D was substantial at 17 ng/mL (42 nmol/L) (Supplemental Fig. 1). If we consider that nonobese subjects, who experience greater increases in 25(OH)D and higher baseline 25(OH)D concentrations, had improved glycemic control, and the adequate vitamin D dose was found to be >100 μg/d (4000 IU/d), one may conclude that studies with inconclusive results simply fail to reach the physiological vitamin D status. In support, if we look at the population characteristics of the trials that reported HbA1c (n = 23), the negative trials included participants who were vitamin D insufficient and/or obese (12, 28–33, 52, 53, 58, 60, 62, 63).

The studies included in this meta-analysis were not totally heterogeneous (high I^2) and used radioimmunoassay, high-performance liquid chromatography, chemiluminescence immunoassay, enzyme-linked immunosorbent assay, and liquid chromatography mass spectrometry—methods that are not fully harmonized. Coefficients of variation ranged between 11% and 25% (80), which may over- or underestimate serum 25(OH)D levels (81). The physiological 25(OH)D concentration may vary based on the method of measurement. A combined analysis of individual level data from the studies analyzed in this work may elucidate an optimal serum 25(OH)D level for glycemic homeostasis as it would allow the use of standardized 25(OH)D concentrations and to take into account body weight. Overall, type 2 diabetic patients need more vitamin D than what is recommended for general population recommended daily allowance, for better glycemic control.

The prevalence of vitamin D deficiency is high in both developed (42% in United States, 32% in Canada, 40% in Europe) and developing countries (60% in Iran, 85% in India, 79% in Saudi Arabia) (82–86), although substantially higher in developing countries. Baz-Hecht and Goldfine (87) have shown that the vitamin D supplementation improves glucose control and benefits insulin resistance in different vitamin D–deficient populations. Yet, the benefits of vitamin D supplementation and improved serum 25(OH)D levels on glycemic control are better highlighted in developing countries. In the current meta-analysis, we found improved glycemic control in different populations, including Iran, Norway, Australia, India, and Nigeria, suggesting that the effects of vitamin D are not unique to specific populations.

Vitamin D was found to improve insulin response and glycemic control. Pancreatic β cell impairment is crucial for the development and progression of type 2 diabetes (88). Vitamin D plays an important role in the regulation of cellular calcium signaling with an indirect effect on regulating insulin secretion from pancreatic β cells (14, 89, 90). Vitamin D may influence C-peptide secretion, an

indicator of insulin secretion (91, 92), and suppress renin-angiotensin activity to preserve β cell function (93). We found that coadministration of calcium with vitamin D improved the impact on glycemic measures, which may be due to the fact that calcium increases insulin sensitivity and improves glucose homeostasis (94, 95). Moreover, vitamin D may improve glucose metabolism systemically through its anti-inflammatory and immunomodulatory effects (96).

The standard of care for diabetes, established by the American Diabetes Association, recommends intensive lifestyle intervention and metformin for diabetes prevention (97). Because of insufficient evidence, vitamin D supplementation in diabetic patients was not recommended to improve glycemic control (98). We compared the changes from baseline of HOMA-IR, FPG, and HbA1c between vitamin D (current meta-analysis) and metformin from the study by Haffner *et al.* (99) to evaluate the clinical significance of vitamin D impact on glycemic control. The average intervention period was 6 to 7 months for vitamin D and 1 year for metformin; however, the lowering effect of vitamin D was half of that of metformin for HOMA-IR (−0.66 vs −1.46), similar to that of metformin for FPG (−0.27 mmo/L vs −0.27 mmol/L) and one-third of metformin for HbA1c (−0.3% vs −1%). However, we believe that vitamin D is not a medication, but, based on our findings, should be included as an adjunct option to help improve glycemic control and provide an assortment of other health benefits.

Although these changes are somewhat modest, considering the differences in study design, sample size, and doses of vitamin D among individual clinical trials, the statistical significance of the pooled data demonstrates its clinical importance. Furthermore, in nutritional epidemiology, not all factors can be controlled for to mimic the real-life situation, and high effect sizes are not expected; rather, more consistent significance is preferred (100). Hence, the current meta-analysis provides promising results for vitamin D as an adjuvant therapy for type 2 diabetes prevention and treatment.

There are several strengths of the current study. Higher numbers of studies included in this analysis, high-dose supplementation in more than half of the included studies, and longer period of trials have added to the value of this meta-analysis, compared with previous published ones. This review is based on an up-to-date literature search representing the most available data on this topic. All included studies were placebo-controlled randomized trials with acceptable methodological quality and the least probable chance of bias. Strength is added by including three different glycemic outcomes measures: HbA1c, FPG, and HOMA-IR. The majority of included studies had been designed for glycemic outcomes and included studies covering a diverse population. Furthermore, we relied on duplicate independent judgment in which two different reviewers independently performed the systematic review process. However, limitations exist in that the trials included in this review were heterogeneous according to the type of outcomes measured, vitamin D dosage, duration of supplementation, and comorbid conditions. A few studies were underpowered (16 to 30 participants per intervention group). We used random model in meta-analysis to overcome these limitations. Most of the included studies did not describe dietary intake and sun exposure contributing to vitamin D synthesis. It was, therefore, difficult to interpret results based solely on vitamin D supplementation. However, we accounted for this by including only studies that measured serum 25(OH)D at baseline and follow-up were included. There were a small number of studies that used calcium in parallel with vitamin D that were included in the meta-analysis for which subgroup analyses were conducted, but statistical significance may be affected by the number of included studies.

Conclusion

This systematic review showed that vitamin D supplementation can improve glycemic control, through lowering HbA1c, FPG, and HOMA-IR. A minimum dose of 100 μg/d (4000 IU/d), which brings serum 25(OH)D values to >40 ng/mL (100 nmol/L), is recommended to improve glycemic measures in type 2 diabetic patients. It seems that the effect of vitamin D was exerted mainly through promoting insulin sensitivity, with the major impact of supplementation on the reduction of HOMA-IR. Our study suggests that vitamin D supplementation could be recommended as adjunct therapy for patients suffering from type 2 diabetes. Clinical trials that examine the effects of vitamin D supplementation with coadministration of diabetic medications should be considered for future investigation to give an unequivocal response to whether vitamin D supplementation can improve glycemic measures in type 2 diabetic patients.

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Alaska State Legislature

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REPRESENTATIVE PAUL SEATON
Rep.Paul.Seaton@akleg.gov

October 16, 2017

To Alaskans concerned about our opioid epidemic:

The opioid epidemic in Alaska is one of the most pressing public health concerns of today. The governor has officially declared it a health emergency. Treatment of this addiction is important, but prevention is the key to reducing the future impact of opioid use on our state. Many people get started using opioids from drugs legally prescribed for pain management. Seeking alternatives to prescribing opiates and reducing their use are important steps in preventing addiction in at-risk populations.

A recent study established a relationship between Vitamin D and increased quality of life for patients in a palliative care unit in Stockholm, Sweden. Authored by Helde-Frankling, M. et al., the study discovered that Vitamin D supplementation improved pain symptoms and reduced both opioid use and infection risk in these patients. This 2017 study on vitamin D in palliative care used a treatment group of 26 and a matched control group. The treatment group was given 4000 IU per day of vitamin D3 over a three-month period. The treatment group reduced overall opioid use by 29%, while the control group increased overall opioid use by 172%. Additionally, prescription of opioids for pain was stopped completely for 18% of the treatment group.

The researchers concluded that "Vitamin D treatment in palliative cancer patients may reduce opioid doses, reduce infections and improve Quality of Life without causing harm to the patients." A large randomized control trial to re-affirm these findings is about to start but will not be completed for two years. Can we wait when other readily available alternatives have not been proposed?

With taskforces convened across the state to study this epidemic, please read this important study. Finding alternatives to prescription drugs will mean less people start down the addiction path; any opportunity to reduce the dosages needed to manage pain without negative side effects should be employed if we truly understand this epidemic as a State emergency.

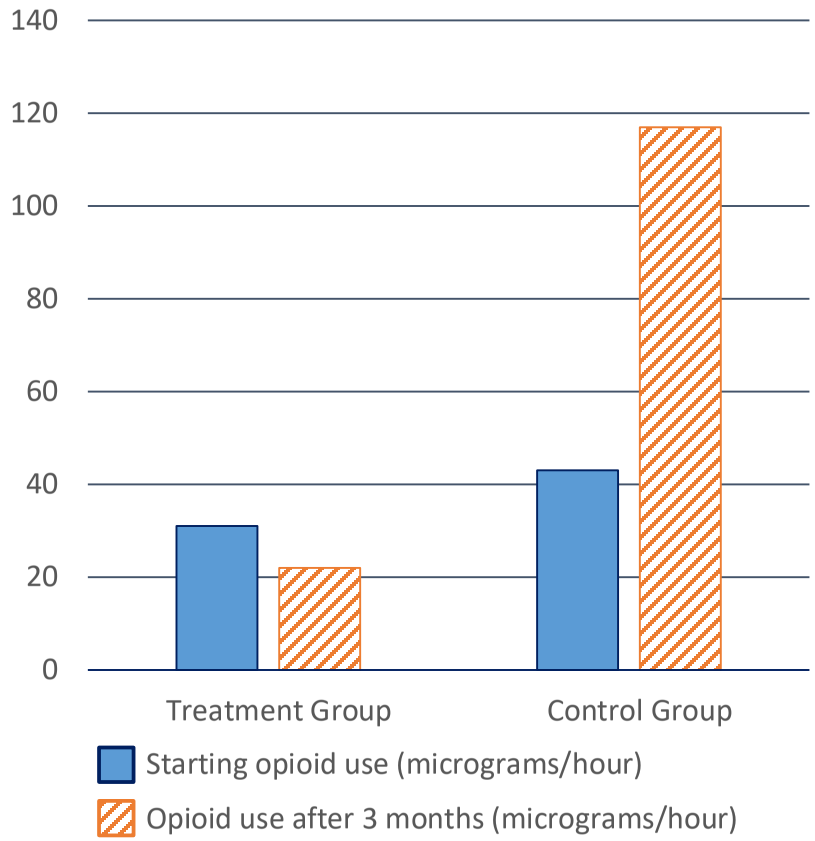
Sincerely,

Rep. Paul Seaton

Health Care Cost Avoidance

Example: Reduction in Opioid Use

- 2017 study: vitamin D & palliative care
- Supplement: 4000 IU vitamin D
- Over three months
  - Treatment group **reduced** overall opioid use by **29%**
  - 18% of treated patients stopped use completely
  - Control group **increased** overall opioid use by **172%**



Helde-Frankling, M. et al. Vitamin D supplementation to palliative cancer patients shows positive effects on pain and infections-Results from a matched case-control study. PLOS One, 2017.

Vitamin D and Pain Relief:

Several studies have found similar results showing that vitamin D can reduce pain and fatigue

- *Helde-Frankling, M. et al. Vitamin D supplementation to palliative cancer patients shows positive effects on pain and infections-Results from a matched case-control study. PLOS One, 2017.* *<Graphed on previous page>*

  Participants took 4000 IU/ day. In supplemented group 29% overall reduction in opioid use, 18% stopped opioid use completely, 26% less antibiotics prescribed to this group. In contrast, the control group increased opioid use by 172%.

- *Yilmaz, R et al. Efficacy of vitamin D replacement therapy on patients with chronic nonspecific widespread musculoskeletal pain with vitamin D deficiency. International Journal of Rheumatic Diseases, 2016.*

  Participants took 50,000 IU/week; Showed a marked decrease in pain, weakness, as well as better sleep.

- *Ropers, S. et al. Effect of Vitamin D Levels on Intrapartum Epidural Consumption. American Society of Anesthesiologists, 2014.*

  Low Vitamin D levels in women associated with higher epidural levels needed during labor.

- *Huang, W. et al. Improvement of Pain, Sleep, and Quality of Life in Chronic Pain Patients With Vitamin D supplementation. Clinical Journal of Pain, 2013.*

  Participants who supplemented showed significantly less pain, better sleep, better general health and social functioning

- *Khan, Q. et al. Effect of vitamin D supplementation on serum 25-hydroxy vitamin D levels, joint pain, and fatigue in women starting adjuvant letrozole treatment for breast cancer. Breast Cancer Research & Treatment, 2014.*

  50,000 IU/ week showed significant improvement in disability from joint pain.

- *Roy, S. et al. Correction of Low Vitamin D Improves Fatigue: Effect of Correction of Low Vitamin D in Fatigue Study. North American Journal of Medical Science, 2014*

  Fatigue improved significantly in medically stable, non-cancer patients

- *Ghai, B. et al. Vitamin D Supplementation in Patients with Chronic Low Back Pain: An Open Label, Single Arm Clinical Trial. Pain Physician, 2017.*

  60,000 IU/week (9,000 IU/day); Pain scores significantly reduced over 2 month, 3 month and 6 month periods. Functional Ability significantly improved, as well.

ANNOUNCEMENTS
PRESENTATIONS
BOROUGH REPORT
COMMISSION REPORTS

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To: Mayor Zak and Homer City Council
From: Parks, Art, Recreation and Culture Advisory Commission
Through: Julie Engebretsen, Deputy City Planner
Date: December 6, 2017
Subject: Budget Recommendations and request for a work session on the HERC building

Requested action at this time: None – a work session has been scheduled for January 8th.

At the November 16th PARCAC meeting, the Commission made the following recommendations:

1. Not to fund SPARC in the amount of $20,000 *(withdrawn by sponsor on 11/27/17 CC meeting)*
2. Requested a work session with Council on the future of the HERC *(Scheduled for 1/8/18)*
3. That Council hold a public forum on the issue of the HERC to allow for public input on the issue.

Minutes excerpt from November 16,2017 PARCAC meeting.

A. Discussion on Annual Budget Request for SPARC and the 2018 Budget

Vice Chair Lowney requested a motion to bring to the floor for discussion.

ROEDL/ARCHIBALD MOVED TO DISCUSS THE BUDGET REQUEST FOR SPARC AND THE 2018 BUDGET

Deputy City Planner Engebretsen provided some background on the budget request proposed by the Mayor to take $20,000 from the Employee Health Care Fund to create a line item in the budget for SPARC.

Discussion ensued on the budget request going outside the established policy of giving funds annually to the Homer Foundation and the non-profits are to apply to them for funding; not having the information necessary to make a recommendation; the rationale that this was to prepare the community for an alternate use of the HERC; the commission cannot support the budget request.

ASHMUN/ARCHIBALD MOVED TO SUBMIT A RECOMMENDATION OF NON-SUPPORT SPENDING $20,000 FOR SPARC IN THE 2018 BUDGET.

There was a brief discussion.
VOTE. NON-OBJECTION. UNANIMOUS CONSENT.

Motion carried.

Vice Chair Lowney expressed concern with the statement about the HERC and how to request the transparency. Staff recommended requesting a worksession with City Council after the first of the year.

Additional comments were made regarding the intent of the statement made by the Mayor with his budget request, clarification was needed before any action could be considered by the commission and the content of a discussion between a member of the audience and the Mayor regarding the use and future of the HERC facility.

Deputy City Planner Engebretsen stated that through the public process a member of Council can bring forth a resolution to sell the building, and the commission could be helpful in a number of ways, if Council wishes the assistance, by offering to host a public forum or similar meeting. It was also noted that the resolution could be remanded to the Commission to obtain the public input or Council could just act on a resolution if presented.

LOWNEY/ROEDL MOVED TO REQUEST A WORKSESSION WITH COUNCIL TO DISCUSS THE HERC AND FOLLOWING THAT DISCUSSION HOLD A PUBLIC FORUM TO ALLOW THE PUBLIC TO PROVIDE INPUT.

There was a brief discussion on including in the worksession the benefit to solving some of the drug usage/addiction that the HERC could provide.

Commissioner Ashmun recommended breaking down the motion to address the facility separate from holding a forum as she could not support the motion as stated. Commissioner Sharp agreed with that recommendation.

Vice Chair Lowney pulled her motion from consideration with consent of Commissioner Roedl as the second to the motion. She restated the motion as follows:

LOWNEY/ROEDL – MOVED TO REQUEST A WORKSESSION WITH CITY COUNCIL ON THE ISSUE OF THE HERC

Discussion ensued on the format; topics to include in the worksession; clarification that defining the hurdles can be addressed in a public forum if Council decides that is the best direction to proceed; responding to specific questions that will be asked of the commission will be staff responsibility; keeping the issues for the worksession on the financial aspects only.

Commissioner Ashmun called for the question.

VOTE. NON-OBJECTION. UNANIMOUS CONSENT.

Motion carried.

LOWNEY/ROEDL – MOVED TO RECOMMEND THAT COUNCIL HOLD A PUBLIC FORUM ON THE ISSUE OF THE HERC TO ALLOW FOR PUBLIC INPUT ON THE ISSUE.

There was no further discussion.
VOTE. NON-OBJECTION. UNANIMOUS CONSENT.
Motion carried.

PUBLIC HEARING(S)

CITY OF HOMER
PUBLIC HEARING NOTICE
CITY COUNCIL MEETING

Ordinance 17-42
Resolution 17-086

A **public hearing** is scheduled for **Monday, December 11, 2017** during a Regular City Council Meeting. The meeting begins at 6:00 p.m. in the Homer City Hall Cowles Council Chambers located at 491 E. Pioneer Avenue, Homer, Alaska.

Ordinance 17-42, An Ordinance of the City Council of Homer, Alaska, Appropriating Funds for the Calendar Year 2018 for the General Fund, The Water Fund, the Sewer Fund, the Port/Harbor Fund, Capital Projects, and Internal Service Funds. City Manager.

Resolution 17-086, A Resolution of the City Council of Homer, Alaska, Amending the City of Homer Fee Schedule Under Camping Fees. City Clerk.

All interested persons are welcome to attend and give testimony. Written testimony received by the Clerk's Office prior to the meeting will be provided to Council.

** Copies of proposed Ordinances in entirety, are available for review online at https://www.cityofhomer-ak.gov/ordinances, at the Homer City Clerk's Office, and the Homer Public Library. Contact the Clerk's Office at City Hall if you have any questions. 235-3130, Email: clerk@ci.homer.ak.us

Melissa Jacobsen, MMC, City Clerk
Publish: Homer News December 7, 2017

CLERK'S AFFIDAVIT OF POSTING

I, Hayley Smith, Deputy City Clerk for the City of Homer, Alaska, do hereby certify that a copy of the Public Hearing Notice for **Ordinance 17-42,** An Ordinance of the City Council of Homer, Alaska, Appropriating Funds for the Calendar Year 2018 for the General Fund, The Water Fund, the Sewer Fund, the Port/Harbor Fund, Capital Projects, and Internal Service Funds. City Manager, and **Resolution 17-086,** A Resolution of the City Council of Homer, Alaska, Amending the City of Homer Fee Schedule Under Camping Fees. City Clerk, was distributed to the City of Homer kiosks located at City Clerk's Office, and the Homer Public Library on Friday, December 4th, 2017 and posted the same on City of Homer Website on Friday, December 4th, 2017.

IN TESTIMONY WHEREOF, I have hereunto set my hand and seal of said City of Homer this 4th day of December, 2017.

Hayley Smith

Hayley Smith, Deputy City Clerk

ORDINANCE REFERENCE SHEET
2017 ORDINANCE
ORDINANCE 17-42

Ordinance 17-42, An Ordinance of the City Council of Homer, Alaska, Appropriating Funds for the Calendar Year 2018 for the General Fund, The Water Fund, the Sewer Fund, the Port/Harbor Fund, Capital Projects, and Internal Service Funds. City Manager. Recommended Dates: Introduction October 30, 2017, Public Hearings November 27, 2017 and December 11, 2017, Second Reading December 11, 2017.

Sponsor: City Manager

1. Council Regular Meeting October 30, 2017 Introduction

2. Council Regular Meeting November 27, 2017 Public Hearing

3. Council Regular Meeting December 11, 2017 Public Hearing and Second Reading

CITY OF HOMER
HOMER, ALASKA

City Manager

ORDINANCE 17-42

AN ORDINANCE OF THE CITY COUNCIL OF HOMER, ALASKA, APPROPRIATING FUNDS FOR THE CALENDAR YEAR 2018 FOR THE GENERAL FUND, THE WATER FUND, THE SEWER FUND, THE PORT/HARBOR FUND, CAPITAL PROJECTS, AND INTERNAL SERVICE FUNDS.

THE CITY OF HOMER ORDAINS:

Section 1. Pursuant to the authority of Alaska Statutes Title 29, the following appropriations are made for the calendar year ending December 2018:

General Fund	$12,451,754
Water Fund	$2,037,962
Sewer Fund	$1,797,681
Port/Harbor Fund	$4,604,592
Capital Projects	$846,788
Total Expenditures	$21,738,777
Internal Service Funds	$2,504,853

Section 2. The amounts appropriated by this ordinance are appropriated to the objects and purposes stated in the adopted budget.

Section 3. Grant funds. (a) If grant funds that are received during the fiscal year exceed the amounts of such funds appropriated by this ordinance by not more than $25,000, the affected appropriation is increased by the amount of the increase in receipts.

(b) If grant funds that are received during the fiscal year exceed the amounts appropriated by this ordinance by not more than $25,000 the appropriation from city funds for the affected program may be reduced by the excess if the reduction is consistent with applicable federal and state statutes.

(c) If grand funds that are received during the fiscal year fall short of the amounts appropriated by this ordinance, the affected appropriation is reduced by the amount of the shortfall in receipts.

Section 4. Donations or charitable contributions. If donations or contributions are received during the fiscal year that exceed the amounts of such funds appropriated by this

ordinance by not more than $5,000, the affected appropriation is increased by the amount of the increase in receipts.

Section 5. A copy of the adopted budget shall be certified by the City Clerk and filed in the office of the City Clerk.

Section 6. The supporting Line Item Budget detail as presented by the Administration and reviewed by the City Council is incorporated as part of this Budget Ordinance.

Section 7. The property mill levy is set at 4.5 mills for 2018.

Section 8. This Ordinance is limited to approval of the Budget and appropriations for Calendar Year 2018, is a non-code Ordinance and shall become effective January 1, 2018.

ENACTED BY THE CITY COUNCIL OF HOMER, ALASKA, this __ day of _____, 2017.

CITY OF HOMER

_____
BRYAN ZAK, MAYOR

ATTEST:

_____
MELISSA JACOBSEN, MMC, CITY CLERK

YES:
NO:
ABSTAIN:
ABSENT:

Introduction:
Public Hearing:
Second Reading:
Effective Date:

Reviewed and approved as to form:

_____	_____
Mary K. Koester, City Manager	Holly Wells, Attorney
Date: _____	Date: _____

Operating Budget Amendments

PG	Amendment	Sponsor	Status
117	$9,394 increase in Finance salary and benefits to rearrange duties and hire qualified accountant (decreases contribution to City Hall reserves)	City Manager	Adopted 11-27
119	$20,000 for SPARC from health insurance fund (decreases balance of health insurance fund)	Mayor	Withdrawn by sponsor
121	$20,000 increase in funding Homer Foundation for non-profit grant program (decreases contribution to City Hall reserves)	Mayor	Withdrawn by sponsor
123	$90,000 increase in salary and wages across all City funds to fund 1% cost of living adjustment (COLA) (increases draw on health insurance fund)	Mayor	Amended to .5%. Adopted 11-27
125	$10,000 increase to Library book budget (decreases transfer to Library reserve	Aderhold	Adopted 11-27

Capital Budget Amendments

		Sponsor	Status
129	$33,415 from Water Reserves to pay stewardship costs for preserving over 300 acres in Bridge Creek Watershed	Erickson	Adopted 11-27
131	$1,000,000 transfer from health insurance fund to police station project ($669,212); Port and Harbor Reserves ($171,429); Water Reserves ($88,424); Sewer Reserves ($70,936).	Smith	Adopted 11-27
133	$750 from Park Reserves to post 3 signs at points of entry into Kachemak Bay to warn recreational users of the hazards of cold water and limits of emergency response capabilities.	Erickson	Adopted 11-27 with PARAC referral
135	Eliminate funding for drone and associated training for Police Department ($34,000)	Smith	
137	Reduce funding for City Hall roof design from $25,000 to $15,000	Smith	

2018 Operating Budget Amendments

11-27-2017

City of Homer
2018 Operating Budget

2018 Proposed Budget Amendment Form

Fund Name: General Fund

partment Number: 0120- Finance and 100-Mayor Council Transfers to Reserves

Account #	Account name	Page #	Increase	Decrease	Balance
5101	Finance Salary and Wages	63	$7,446		$364,530
5102	Finance Fringe Benefits	63	$1,948		$207,359
5990	Transfer to (City Hall Reserve)	47		$9,394	$139,713

Rationale:
Duties in the Finance Department will be reorganized in order to more evenly distribute work load and avoid critical tasks falling through the cracks. This requires a budget amendment to be able to hire a trained accountant to fill a current vacancy. An accountant with education and/or extensive experience in the field is required for the complex operations the City asks of Finance employees and the high standard we hold the department to.

Requested By:
City Manager

Prepared By:
City Manager

City of Homer
2018 Operating Budget

2018 Proposed Budget Amendment Form

Fund Name: Health Insurance Fund/ General Fund

Department Number:

Account #	Account name	Page #	Increase	Decrease	Balance
600	Health Insurance Fund	198	$12,039		$0
100-350-58XX (new)	SPARC	73	$20,000		$20,000

Further Explanation of Amendment:

The FY2018 draft budget anticipated a 15% increase in health insurance. This was budgeted for through an allocation of $1350 per employee per month (up from $1250 in 2017) through the operating budget, employee contributions increasing by 15%, and a $381,906 draw from the Health Insurance Fund. The actual negotiated increased came in at 8.2% more than FY2017. This means that for the 2018 budget there is no anticipated draw on the Health Insurance Fund but rather a deposit of $32,039. This amendment proposes to increase General Fund expenditures by $20,000, which would result in a $12,039 deposit in the Health Insurance Fund.

Rationale:

The South Peninsula Athletic and Recreation Center (SPARC) was built last year through a grass roots, community wide effort. The community came together and donated funds, labor and materials. In the spirit of partnership and community, the City provided $189,000 in capital funding and the Kenai Peninsula Borough provided the land. In the end, the community has a facility where all ages can come together, recreate, and be healthier. This amendment provides $20,000 in operating funds to SPARC. It is the intent that funds for SPARC be included in the operating budget for 5 years to help the new organization get off the ground. A successful SPARC helps prepare the community for an alternate use of the HERC.

SPARC is an opportunity for the entire community to be proactive in creating healthy citizens and a way to reduce future health care costs for our citizens, city, and state.

withdrawn by sponsor

Requested By:
Mayor Zak

Prepared By:
City Manager

City of Homer
2018 Operating Budget

2018 Proposed Budget Amendment Form

Fund Name: General Fund

Department Numbel 0350 (Non-Departmental) and 0100 (Mayor/Council)

Account #	Account name	Page #	Increase	Decrease	Balance
5990-159-0384	Transfer to City Hall Reserve	47		$20,000	$129,107
100-5830	Homer Foundation	73	$20,000		$45,000

Rationale:

The Homer Foundation plays an important role for the non-profit community in Homer. As manager of the City of Homer grant program, it provides for the distribution of $35,000 annually to area non-profits in a professional and thoughtful manner (a combination of the annual appropriation and interest earned on the endowment fund). These funds provide crucial unrestricted operating revenue for Homer area non-profits. Increasing the annual City of Homer contribution will provide expanded support for non-profits in a time of tight budgets around the state and help them weather the economic downturn.

withdrawn by sponsor

Requested By:
Mayor Zak

Prepared By:
City Manager

City of Homer
2018 Operating Budget

2018 Proposed Budget Amendment Form

Fund Name: All Funds

partment Number: All Departments

Account #	Account name	Page #	Increase	Decrease	Balance
5102	Fringe Benefits (city-wide)			90,000	
5101	Salary and Wages (city-wide)		90,000		
11-27 adopted amendment					
5102	Fringe Benefits (city-wide)			45,000	
5101	Salary and Wages (city-wide)		45,000		

Further Explanation of Amendment:
The FY2018 draft budget anticipated a 15% increase in health insurance. This was budgeted for through an allocation of $1350 per employee per month (up from $1250 in 2017) through the operating budget, employee contributions increasing by 15%, and a $381,906 draw from the Health Insurance Fund. The actual negotiated increased came in at 7.7% more than FY2017 actual. This means that for the 2018 budget, all other variables reminaing constant, there is no anticipated draw on the Health Insurance Fund but rather a deposit of $21,535.

This amendment proposes to decrease the per employee allocation for health insurance from $1350 to $1275 in order to fund a 1% COLA for employees. The net result of this amendment is a $71,165 draw on the Health Insurance Fund to cover the remainder of employee health insurance costs.

Rationale:
The employee committee has made several concessions to health insurance in order to find greater savings for this city. These include changing prescription drug coverage and eliminating the more generous 'buy-up' plan as an option for employees. This, combined with aggressive negotiation, has resulted in significantly less than the draft budget presented in Health Insurance costs to the City (a 7.7% increase instead of a 15% increase). In addition, the City needs to consistently inflation proof the wage scale through COLAs to maintain competitive. This is best done through small regular COLAs rather than large sporadic ones that are challenging to budget for.

Requested By:
Mayor zak

Prepared By:
City Manager

City of Homer
2018 Operating Budget

2018 Proposed Budget Amendment Form

Fund Name: General Fund

partment Number: 100-0145 Library/ 100-0100 Mayor Council

Account #	Account name	Page #	Increase	Decrease	Balance
100-0145-5228	Books	68	$10,000		$37,000
100-0100-5990	Transfers to (Library Reserve)	47		$10,000	$90,000

Rationale:

Book budget was cut by $20,000 (43%) in 2016. We relied on a Rasmuson grant to make up much of the difference in 2016. In 2017 we are using up most funds remaining in the Library Donation Fund to get by. Even with those additions, due to budget limitations we are returning worn out books to the shelves, which should be replaced, and are unable to adequately update some sections of the collection, for example Reference (which tends to contain very expensive books) and popular circulating sections, such as health/medical and travel guides.
The price of books continues to rise.
Tumblebooks, our most well-used e-resource with over 8,300 uses in the past year, has been funded either in full or partially for the past two years by private donors and community groups because we could not afford to maintain it. This is not sustainable.
Despite the fact that the Homer Library has now surpassed Soldotna, Kenai and Kodiak in circulation of materials (books, periodicals, A-V), our budget for circulating materials consistently lags behind.
It is time to restore at least some funding to the book budget to avoid a deteriorating collection.

Requested By:
Councilmember Aderhold

Prepared By:
City Manager

2018 Capital Budget Amendments

11-27-2017

City of Homer
2018 Capital Budget

2018 Proposed Budget Amendment Form

Fund Name: **Water Reserve**

Project name: Acreage protection in theBridge Creek Watershed.

Account #	Account name	Page #	Increase	Decrease	Balance
256-0378	Water Reserves	158		$ 33,415.70	$ 2,603,228.30

Rationale:

This request for $33,415.70 will cover the stewardship costs for a Conservation Easement to protect 302 acres into perpetuity. Of the 302 acres, 273.61 acres are within the Bridge Creek Watershed and the other 28.55 acres feed into the anadromous Bridge Creek.

The sterwardship costs, $33,415.70 are paid to Kachemak Heritage Land Trust (KHLT) and cover the annual monitoring, reporting, record keeping, and a federally negotiated indirect overhead rate.

The goal of the Conservation Easement is to protect riparian and wetland water resources, the forest, the wildlife and scenic open space which all contribute to the health of the Bridge Creek Water Shed.

Watershed protection for $110.59 per acre into perpetuity.

Requested By:
Councilmember Erickson

Prepared By:
City Manager

City of Homer
2018 Capital Budget

2018 Proposed Budget Amendment Form

Fund Name: All Funds

Department Number: All Departments

Account #	Account name	Page #	Increase	Decrease	Balance
600	Health Insurance Fund	198		$1,000,000	$597,502
156-0376	Police Station Fund		$669,212		$2,299,503
456-0380	Port and Harbor Reserve		$171,429		$4,166,285
256-0378	Water Reserve		$88,424		$2,725,068
256-0379	Sewer Reserve		$70,936		$2,299,206
*excludes FY2018 proposed trasnfer to reserves and any approved capital projects					

Further Explanation of Amendment:
The FY2018 draft budget anticipated a 15% increase in health insurance. This was budgeted for through an allocation of $1350 per employee per month (up from $1250 in 2017) through the operating budget, employee contributions increasing by 15%, and a $381,906 draw from the Health Insurance Fund. The actual negotiated increased came in at 7.7% more than FY2017. This means that for the 2018 budget there is no anticipated draw on the Health Insurance Fund but rather a deposit of $21,535.

This amendment proposes to transfer money from each fund that has accumulated in the health insurance fund back into their reserve funds. Under the general fund, it further specifies that the returned funds be allocated to the police station project.

	FTEs	% Multiplier	$1 million Split
General Fund	67.93	0.67	669,212
Port and Harbor	17.40	0.17	171,429
Water	8.98	0.09	88,424
Sewer	7.20	0.07	70,936
Total	101.5	100%	1,000,000

Rationale:
It is unreasonable to have almost 1 year of health insurance premiums in the Health Insurance Fund.

Requested By:
Councilmember Smith

Prepared By:
City Manager

City of Homer
2018 Capital Budget

2018 Proposed Budget Amendment Form

Fund Name: General Fund

partment Number: 100

Account #	Account name	Page #	Increase	Decrease	Balance
156-0538	Parks & Rec Depreciation	158		$750	$67,349

Rationale:
The purpose of this amendment is to post 3 signs at points of entry within City limits to Kacheamk Bay to advise recreatonal users of the hazards of cold water recreation and the limitation of local response capabilities. The cost is approximately $250 per sign.

Requested By:
Councilmember Erickson

Prepared By:
City Manager

City of Homer
2018 Capital Budget

2018 Proposed Budget Amendment Form

Fund Name: General Fund- 100

Project name: Delete Drone for search and rescue (HPD) from draft 2018 capital budget

Account #	Account name	Page #	Increase	Decrease	Balance
100-0160-5231	Police Reserves	165		$34,000	

Rationale:

While there is some utility in having this search and rescue tool, for the cost and associated training requirements, there are other tools that should be invested in that would be used more frequently and help the department on a broader scale. Search and rescue efforts are minimal for our department and remain the jurisdiction of the State Troopers. Thermal imagining of burning buildings could be helpful, however our risk management to date has been effective absent a drone. The planning departments benefits could be met at a much lower cost. This request is for a very high end and expensive drone.

This amendment leaves the Police Reserves account intact, est. 2017 yearend balance of $269,103

Requested By:
Councilmember Smith

Prepared By:
City Manager

City of Homer
2018 Capital Budget

2018 Proposed Budget Amendment Form

Fund Name: General Fund - 100

Project Name: Reduce funding for design of City Hall roof from $25,000 to $15,000

Account #	Account name	Page #	Increase	Decrease	Balance
156-0384-5903	City Hall Reserves	172		$10,000	$15,000

Rationale:
This amendment reduces the amount availible to design a new roof from City Hall from $25,000 to $15,000.

Requested By:
Councilmember Erickson

Prepared By:
City Manager

12-4-17

To the City Council of Homer

My name is Jane Regan and I live within the city limits. When considering the budget, please be generous to the library.

My use of the library is mainly for borrowing books, and using the cubicles. I am a volunteer tutor at the college, for the ESL program. The cubicles are perfect for one-on-one learning. And it's a good way to introduce these newcomers to the library.

I appreciate that the conference room usage (book groups, presentations, kids' activities, etc.) is open to all, including people who live out of town. They are part of our community.

I appreciate that "Libraries are for Everyone" including homeless people. They are part of our community too. Please consider hiring a part time social worker to do out-reach to people who hang out in the library. Other cities, including Anchorage, already do this.

I think that we, as a community, could agree that we want to have an educated population. Fully funding the library is part of working together toward this goal.

Please restore the $20,000 by which the library budget was reduced a couple years ago in full.

Thank you for reading this and for giving of your time to serve the city.

Sincerely
Jane Regan

CITY OF HOMER
HOMER, ALASKA

City Clerk

RESOLUTION 17-086

A RESOLUTION OF THE CITY COUNCIL OF HOMER, ALASKA, AMENDING THE HOMER FEE SCHEDULE UNDER CAMPING FEES.

WHEREAS, Camping fees for RV and tent camping are increased to be comparable to other communities on the Peninsula.

NOW, THEREFORE, BE IT RESOLVED that the City Council hereby amends the Homer Fee Schedule Camping fees as follows:

CAMPING FEES

(The following fees have been set by legislative enactments, Resolutions 16-109, 15-097(S)(A), 05-05, 04-98(S)(A), 99-94, 93-35, 91-34 and; 91-20(S)).

"Campground" means an area owned, controlled, developed and/or maintained by the City, which contains one or more improved campsites or contains adequate area for one or more unimproved campsites.

"Camping" means:

1. The erection of, or occupancy of any tent.
2. The placing or leaving of any items normally found at a campsite within campsite such as cook stoves, lanterns, sleeping bags or bedding.
3. Parking of any camper unit in any area owned or controlled by the City that has been designated a camping area by official signs, in excess of twenty-four hours.

"Camping Season" means that period of time from April 1 through October 30.

RV $ ~~20~~ **24**/day

All other camping $~~13~~ **15**/day

All fees inclusive of sales tax.

PASSED AND ADOPTED by the City Council of Homer, Alaska, this _____ day of_____ _____, 2017.

CITY OF HOMER

_____
BRYAN ZAK, MAYOR

ATTEST:

_____
MELISSA JACOBSEN, MMC, CITY CLERK

Fiscal Note: Revenue amounts not defined in CY2018 budget.

ORDINANCE(S)

CITY MANAGER'S REPORT

City of Homer
www.cityofhomer-ak.gov

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Memorandum

TO: Mayor Zak and Homer City Council

FROM: Katie Koester, City Manger

DATE: December 6, 2017

SUBJECT: City Manager's Report for December 11th, 2017

Subdivision Agreement with Quiet Creek Subdivision

The Planning Commission approved a final plat for the proposed development of Quiet Creek Subdivision which has allowed Public Works to move forward with a Construction Agreement with the developer, Echo Trading Company for the construction of all required road, drainage, water, sewer and non-City owned utilities. The developer has agreed to extend water and sewer and construct the road through Ronda Street off of East End and part of Nelson Avenue. This will benefit 6 properties and create a water and sewer main loop to connect with the East End main. This is beneficial to the City as dead end water mains require more maintenance, flushing and the homes are more vulnerable to service interruption. Another benefit is City funds will not be used to create a SAD for these improvements. The developer will work independently with the property owners to share in the cost of extending the services. However, a property owner has every right not to participate. HCC 11.30 (for road) and 14.30 (for water and sewer) provides a mechanism for the developer to be reimbursed for the initial investment (minus a 15% administrative fee for the City) should that property owner hook up to water and sewer or request a driveway permit to access the road in the future. The payment plan for those property owners who choose to defer to a later date requires Council approval. After construction is complete, the developer is required to submit an affidavit from each property owner that did not participate in the cost sharing through the initial construction and costs associated with installing the infrastructure. From that, Council will determine final terms and conditions. Echo trading Company is expecting to complete construction in 2018, which means it could come before Council as early as the end of 2018.

Industry Forum

The Kenai Peninsula Economic Development District is hosting the 2018 Industry Outlook Forum January 10th at the Soldotna Regional Sports Complex. The Forum is free and open to the public but you have to register by January 5th https://kpedd.org/2018-industry-outlook-forum/ The Forum is an opportunity to hear updates from a Peninsula perspective on oil and gas, mining, education, tourism, fishing, agriculture, the medical industry, non-profits and local entrepreneurs (agenda attached).

Fire Hall Project Completion Report
A report on the Fire Hall project is attached. Good news – the project came in almost $100,000 under budget. In addition to excellent local project management, Public Works Director Meyer jumped in whenever he could to keep costs down. The only remaining item on the todo list is the 1% for the arts. We will likely combined this with an upcoming project, issue an RFP and solicit PARAC guidance on the public art component.

Investment Recommendations from Finance Department
In an attempt to get maximum utility out of our dollars, the Finance Director will be moving $4.5 million of liquid funds in the Alaska Municipal League Investment Pool (AMLIP) account to short and medium term bonds, consistent with the City of Homer investment policy. Finance has done a cash flow analysis and determined we need to keep a minimum of $4million in the AMLIP account to cover cash flow, payroll and projects. In addition the Finance Department will be consolidating the City's two primary investment accounts with one firm. The bonds the City holds will remain the same, however consolidation will allow us to keep a much better handle on making sure the schedule for the maturity of the bonds is consistent with anticipated upcoming expenditures and that we don't hold more than the FDIC insured amount in any one investment. See memo from the Finance Director for more details.

Enc:

Employee Anniversaries
Fire Hall Project Completion Report
Industry Forum Agenda
Memo from Finance Director on Investments

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Memorandum

TO: MAYOR ZAK AND CITY COUNCIL

FROM: Katie Koester

DATE: December 11, 2017

SUBJECT: December Employee Anniversaries

I would like to take the time to thank the following employees for the dedication, commitment and service they have provided the City and taxpayers of Homer over the years.

Mark Robl,	**Police**	**33**	**Years**
Will Hutt,	**Police**	**23**	**Years**
Bryan Hawkins,	**Port**	**18**	**Years**
Todd Cook,	**Public Works**	**8**	**Years**
Chris Cushman,	**Fire**	**8**	**Years**
Angie Otteson,	**Public Works**	**8**	**Years**
Katie Koester,	**Admin**	**6**	**Years**
Sean Perry,	**Police**	**3**	**Years**
Mike Zelinski,	**Public Works**	**3**	**Years**
Peter Alfiche	**Port**	**1**	**Year**

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(f) 907-235-3145

Memorandum

TO: Katie Koester, City Manager

FROM: Carey S. Meyer, Public Works Director

DATE: December 1, 2017

SUBJECT: **Fire Hall Improvements 2017**
Final Report

The improvements the Homer Fire Hall are complete. The Council approved spending $850,000 to renovate the existing structure with the intent of extending the buildings life for at least another 10 years. Public Works utilized the existing GC/CM contract with Cornerstone/Stantec to complete the design and construction of the project. All work was completed by local subcontractors. The construction superintendent was hired locally. Project oversight and contract administration was completed by Public Works.

The work consisted of exterior painting/staining, pavement removal/replacement to solve frost heave problems, pavement expansion and drainage improvements, new covered vehicle storage shed, exterior stair replacement, renovation of flat roof area, interior floor covering replacement, interior wall painting, new kitchen/appliances, new bathrooms/showers, new audio/visual equipment, new personnel lockers and equipment lockers, floor slab replacement in Bays 2 and 3, IT room improvements, and furnishing upgrades.

The project was completed within the budget set by the Council:

Design	$ 57,281.84
Construction	$ 697,679.52
Project Management	$ 2,414.41
1% for Art	$ 6,976.80
Total Cost	$ 764,252.57

Cornerstone General Contractor's actual construction cost was 7% less and Stantec completed the design for more than 10% less than their maximum contract amounts. The local subcontractors completed their work within their contract amounts or with minor change orders. As a whole, the project benefited from the GC/CM contract, both in the ability to reduce actual costs during construction and in creating an environment that incentivized teamwork and work quality.

Leadership to enhance, foster and promote economic development

INDUSTRY OUTLOOK FORUM

HOSTED BY

Kenai Peninsula Economic Development District

And Supported By

Cities and Chambers of Commerce of:

Kenai, Soldotna, Seward and Homer

Wednesday, January 10th, 2018

8:30	**Registration & Coffee**	
9:00 - 9:10	**Welcome – Tim Dillon** Pledge of Allegiance	10 min
9:10 - 9:30	**Albert Wall – CEO** *Peninsula Community Health Services*	20 min
9:30 - 9:50	**Alex & Sarah Douthit, Owner – Local Entrepreneur** *Kenai Peninsula Driving Instruction*	20 min
9:50 - 10:30	**Alyssa Rodrigues, Manager – Economic Forecast** *Department of Commerce, Community & Economic Development*	40 min
10:30 -10:40	**Networking Break** *Door Prize*	10 min
10:40 - 11:00	**Penny Gage, Business Development Officer – Crowd Funding in Alaska** *Department of Commerce, Community & Economic Development*	20 min
11:00 - 11:30	**Ron Hyde, Owner – Upcoming Projects** *PRL Logistics*	30 min
11:30 - 11:50	**Jennifer Gibbins, Ricky Gease, Mary Peltola** *Alaska Salmon Fellows*	20 min

12:00 - 1:00	**Lunch Speaker: Laurie Wolf, President & CEO –** **The Role of Non Profits in Alaska** *Foraker Group* *Door Prize*	30 min
1:00 - 1:20	**Kara Moriarty, Executive Director** *AOGA*	20 min
1:20 - 1:50	**Deantha Crockett, Executive Director** *Alaska Mining Association*	30 min
1:50 - 2:10	**Joel Cladouhos, Director** *Alaska's Blue Economy*	20 min
2:10 - 2:20	**Networking Break** *Door Prize*	10 min
2:20 - 2:50	**Lieza Wilcox, Vice President Commercial & Economics** **Fritz Krusen, Vice President for LNG & Administrative Services** *Alaska Gasline Development Update*	30 min
2:50 - 3:10	**- Workforce Panel –** **Cathy LeCompte, Director** *AVTEC* **Sean Dusek, Superintendent** *KPBSD* **Gary Turner, Director** *Kenai Peninsula College*	20 min
3:10 - 3:30	**Dave Wilkins – Senior Vice President** *Hilcorp Alaska*	20 min
3:30 - 4:00	**Summer Lazenby, Executive Director** *KPTMC* **Sara Leanard, President & CEO** *ATIA*	30 min
4:00 - 4:20	**Bart Garber – CEO** *Kenaitze Indian Tribe*	20 min
4:20 - 4:40	**Marc Theiler, Owner** *Red Run Cannabis Company*	20 min
4:40 - 5:00	**Mike Navarre, Commissioner** *Alaska Department of Commerce, Community & Economic Development*	20 min
5:00 - 5:05	**Charlie Pierce, Borough Mayor – Wrap up**	5 min
5:05 - 6:00	**Reception - Breweries**	55 min

City of Homer
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(p) 907-235-8121
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Memorandum

TO: Mayor Zak and Homer City Council

THROUGH: Katie Koester, City Manager

FROM: Elizabeth Walton, Finance Director

DATE: December 6, 2017

SUBJECT: Consolidation and Analysis of Investment Accounts

The purpose of this memo is to provide a recommendation to transfer funds out of the City of Homer's primary AMLIP account and reinvest those funds with TVI. Also included is an analysis of the City of Homer's two primary investment accounts and the recommendation to consolidate them.

As of October 31, 2017, the balance of the City of Homer's primary AMLIP account is $8,517,330.28. After performing an analysis of cash flows and liquidity needs, it is our recommendation to decrease this balance to $4 million. This new balance is conservative and will cover all immediate expenses and still leave some room for unexpected project spending. Due diligence will be done to invest this roughly $4.5 million in an effort to ladder maturities to ensure that funds are readily available in the future to meet project demands.

To address the concerns that were raised during the audit process, it is the Finance Department's recommendation to make every attempt to consolidate investment accounts. Given the constraints of our current investment policy, there is no added benefit of having a multitude of investment accounts. In an effort to improve the efficiency of the audits in years to come, it would be of great benefit to consolidate these accounts.

It is the immediate recommendation of the Finance Department to consolidate the City's two primary investment accounts (outside of the AMLIP money market accounts). Due to the customer service and communications we have had with TVI, it would be our recommendation to transfer all funds from Raymond James into our TVI account. This will eliminate the added stress of ensuring we do not exceed FDIC insurance coverage on our Certificates of Deposit (CD) investments. It will also allow for us to maximize the potential growth of the City of Homer's investments.

Analysis of the remaining investment accounts and determination on how to consolidate (if possible) is forthcoming.

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Memorandum

TO: MAYOR ZAK AND CITY COUNCIL

FROM: RENEE KRAUSE, CMC, DEPUTY CITY CLERK

DATE: DECEMBER 5, 2017

SUBJECT: BID REPORT

REQUEST FOR PROPOSALS FOR OPERATION OF FISH PUMP SERVICES ON THE HOMER PORT & HARBOR FISH DOCK

The City of Homer, Alaska is requesting proposals from qualified individuals or firms that are interested in entering into a five-year Agreement with the City of Homer Port and Harbor for the purpose of operating a fish pump transfer service located on the south end of the City's Fish Dock. Successful proposers will operate, manage, and maintain the fish pump station located on the south end of the Fish Dock for the exclusive purposes of increasing fish offload speed for dock users, increase the volume of fish that crosses the dock, and providing a fish offloading service for hire.

An **optional pre-proposal meeting/teleconference** will be held **Tuesday, December 19th, 2017** at **2:00 p.m.** at the Homer City Hall Conference Room.

Sealed proposals for the Fish Pump Services on Homer Fish Dock will be received at the office of the City Clerk, City Hall, City of Homer, 491 East Pioneer Avenue, Homer, Alaska, **until 4:00 p.m., Friday, January 12, 2017.** The time of receipt will be determined by the City Clerk's time stamp. Proposals received after the time fixed for the receipt of the bids shall not be considered.

REQUESTS FOR PROPOSALS TO LEASE SPACE AT THE HOMER AIRPORT TERMINAL

Sealed proposals for the leasing spaces at the Homer Airport Terminal will be received at the office of the City Clerk, 491 E. Pioneer Avenue, Homer, AK 99603 by the submittal deadline: **8:30am on Monday, January 15, 2018.**

Description of airport spaces and rent/lease fee (see floor plan):

- Concession area (across from RAVN's ticket counter) is 160 sf. $2 psf plus concession fees and taxes.
- Concession area across from the baggage claim/ramp is 110 sf. $2 psf plus concession fees and taxes.
- Ticket counter, office and baggage enplanement, 700 sf for $2,600 per mo. and taxes
- Two Cargo areas at the west end of the airport. 768 sf each for $2,850 per mo. and taxes

The time of receipt will be determined by the City Clerk's time stamp. Proposals received after the deadline, will not be considered. Applicants are required to submit a City of Homer Proposal Holders Registration form to be on the Proposal Holders List. The City reserves the

right to accept or reject any and all proposals and to waive irregularities or informalities in the proposals. There is a $30 nonrefundable Lease Application fee due with RFP submittal.

INVITATION TO BID HOMER HARBOR CATHODIC PROTECTION PROJECT 2018

Sealed bids for the construction of the Homer Harbor Cathodic Protection Project 2018 project will be received at the Office of the City Clerk, City Hall, City of Homer, 491 East Pioneer Avenue, Homer, Alaska, **until 2:00 p.m. on Thursday, January 11th 2018,** at which time they will be publicly opened and read. The time of receipt will be determined by the City Clerk's time stamp. Bids received after the time fixed for the receipt of the bids shall not be considered. All bidders must submit a City of Homer Plan Holders Registration form to be on the Plan Holders List and to be considered responsive. Plan holder registration forms and Plans and Specifications are available online at http://www.cityofhomer-ak.gov/rfps

A **Pre-Bid Conference** will be held at **1:30 p.m. on Friday December 15, 2018** at the site to answer bidder's questions.

The City's local bidder's preference requirements does apply to this contract; State prevailing wage rates will apply. The work includes furnishing and installing a sacrificial anode cathodic protection system on the harbor float pipe piles. Anodes will be welded to the piling by ADCI certified commercial divers.

CITY ATTORNEY REPORT

COMMITTEE REPORTS

City of Homer

www.cityofhomer-ak.gov

MEMORANDUM

TO: MAYOR ZAK AND CITY COUNCIL

FROM: MATT CLARKE, CHAIR, EMPLOYEE COMMITTEE

DATE: DECEMBER 5, 2017

SUBJECT: EMPLOYEE COMPENSATION

On behalf of the employee committee, we would like to take a minute to reflect on the meeting last Monday, November 27, 2017. Considering the polarized climate of our national politics and the diverse political beliefs that exist among our council members, we want to commend you for reaching across political and ideological boundaries in the compromise of .5% that was reached on the Mayor's proposed 1% COLA for city employees. In the grand scheme of things, we believe this is how government should work at every level.

We understand operating a sustainable, balanced budget and business model for the city of Homer is a number one priority. And that the questions of, "How can we better serve our community?" and "How should we compensate our employees?" have to be factored in throughout the budget process.

Council's amendment does reasonably provide for inflation proofing for employees' wages for one year. In 2018, the employee committee will resume discussion on several issues you touched on: the inequity of a COLA between top wage earners and bottom wage earners, a consideration for longevity pay for those employees who have reached the end of their wage scale, and ensuring the competitiveness of the employees' compensation package while managing the City's long-term growth of those costs.

We look forward to future correspondence regarding these matters.

PENDING BUSINESS

NEW BUSINESS

RESOLUTIONS

COMMENTS OF THE AUDIENCE
COMMENTS OF THE CITY ATTORNEY
COMMENTS OF THE CITY CLERK
COMMENTS OF THE CITY MANAGER
COMMENTS OF THE MAYOR
COMMENTS OF THE CITY COUNCIL
ADJOURNMENT